Cybernet

Stereo Receiver

SRC-80

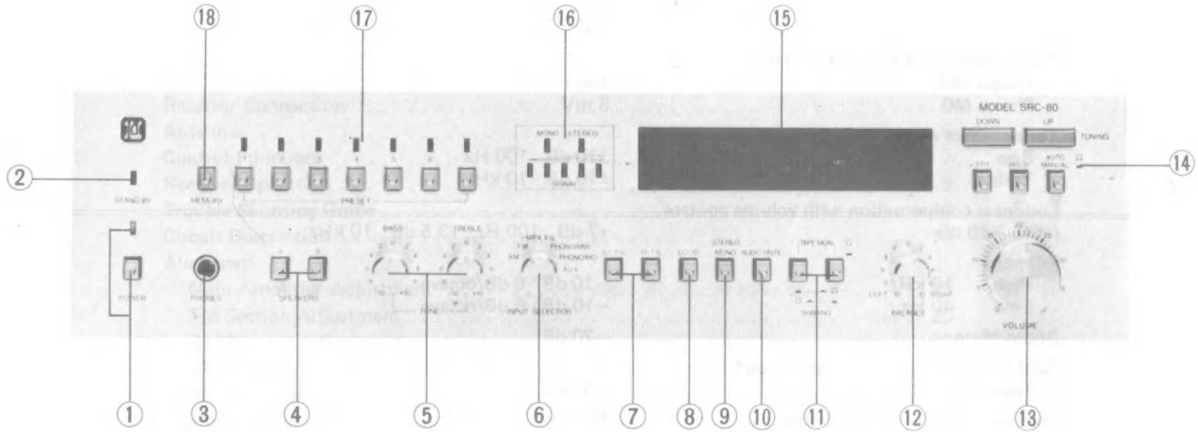
Service Manual

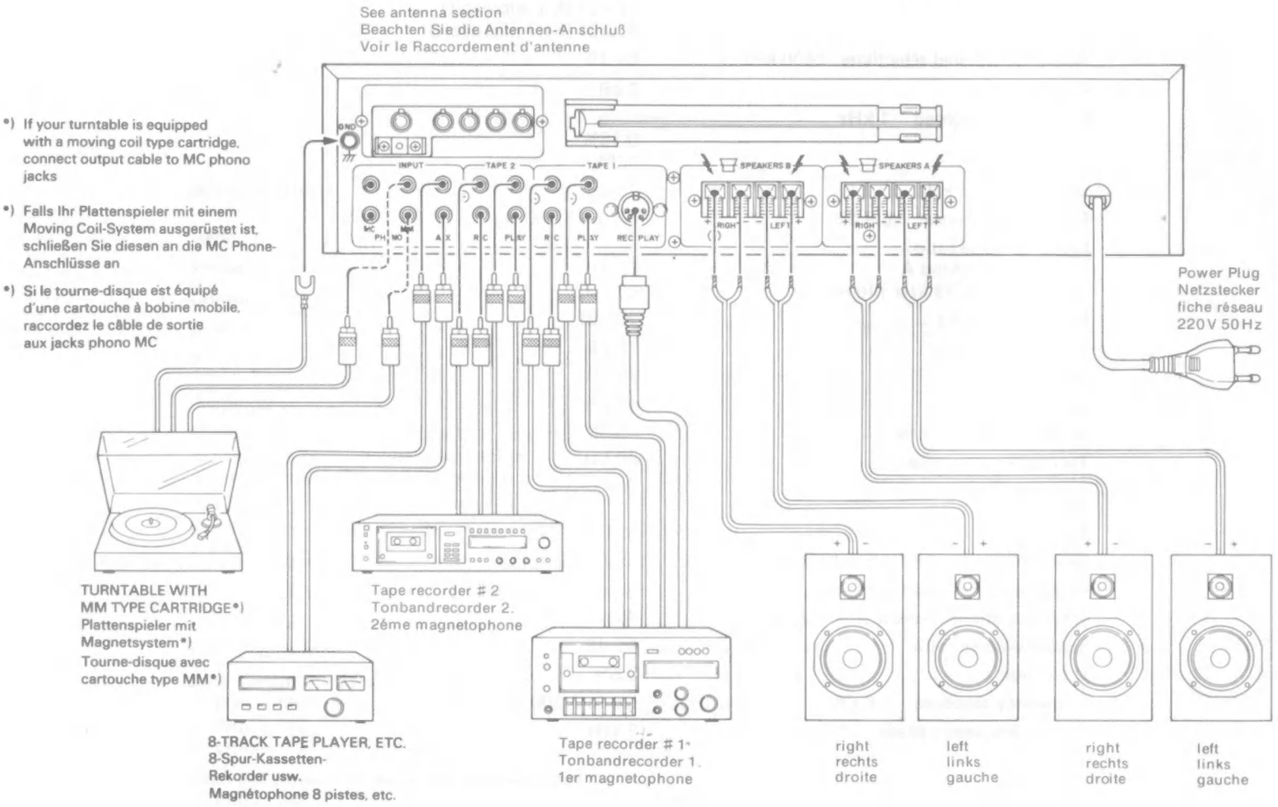
CONTENTS

Specifications

General	
Power requirement	AC 220 volt, 50 Hz
Consommation	400W
Dimensions	430 mm W/100 mm H/390 mm D
Weight	12.3 kgs
Amplifier	
Minimum continuous RMS output power per channel, both channels driven into 8 ohm over 20 to 20,000 Hz with no more than rated THD	50 watt
Total harmonic distortion at rated output	0.08%
Intermodulation distortion at rated output	0.08%
Frequency response	±0.5 dB, 20 to 20,000 Hz
Phono RIAA tolerance over 20 to 20,000 Hz	±0.5 dB
Powerbandwidth	–3 dB, 7 to 35,000 Hz
Input sensitivity for rated output	
Phono MM	2.5 mV 47 kohm
Phono MC	100 microvolt 47 ohm
Others	150 mV 47 kohm
Hum and noise ratio weighted, shorted input	
Phono MM	73 dB
Phono MC	62 dB
Others	93 dB

Phono overload 1 kHz, 0.5% THD	
Phono MM	150 mV
Phono MC	6 mV
Tone control range	
Bass	±10 dB 100 Hz
Treble	±10 dB 10 kHz
Loudness compensation with volume control set to –30 dB	+7 dB 100 Hz, +3.5 dB 10 kHz
Filterage	
High 10 kHz	–10 dB 6 dB/octave
Low 40 Hz	–10 dB 6 dB/octave
Audio Mute	–20 dB
Tape Recording output a rated input	
Tape Rec 1/2	130 mV
Damping factor 1 kHz, 8 ohm	40
FM Tuner	
Tuning range	87.5 to 108.0 MHz
Usable sensitivity	
Mono	10.9 dBf
Stereo	20 dBf
50 dB-noise-quieting sensitivity	
Mono	18 dBf (4.4 microvolt)
Stereo	40 dBf (54.7 microvolt)
Alternate channel selectivity ±400 kHz	60 dB
Capture ratio	2 dB
Distortion weighted 1 kHz	
Mono	0.15%
Stereo	0.3%
Separation 1 kHz	45 dB
Frequecy response ±0.5 dB	30 to 15,000 Hz
Signal-to-noise ratio	
Mono, weighted A	70 dB
Stereo, (19/38 kHz filtered)	65 dB
Muting threshold	20 dBf
Spurious response	70 dB
IF rejection	70 dB
Image rejection	45 dB
Subcarrier product ratio	65 dB
Tuning frequency space	50 kHz
AM Tuner	
Tuning range	531 to 1,602 kHz
Sensitivity built-in antenna, S+N/N 20 dB	350 microvolt/m
Image rejection 600 kHz	45 dB
Alternate channel selectivity 20 kHz	45 dB
Signal-to-noise ratio	45 dB
Distortion	0.5%
Frequency response –6 dB	Up to 2,300 Hz
Tuning frequency space	9 kHz





The Stereo System

The Cybernet **model SRC 80** is a high fidelity stereo receiver designed to be incorporated with other high fidelity components into a complete stereo system. It features the following:

– Digital-tuner programmed electronic tuning.- 7 electronic pushbottons to store one AM station and one FM frequency for a total of 14 selections in all - entered in memory for instant recall. - Fluorescent frequency readout maintaining accuracy of frequency readout. - Outputs and switching for one or two pair of loudspeakers. - Inputs for two stereo turntables; one equipped with the MM type cartridge and one with the MC type cartridge. - 75 ohm and 300 ohm antenna inputs for FM. - Sensitive dual-gate MOS FET in the FM front-end. – Three dual-element ceramic filters in the IF section. PLL (phase locked loop)IC in the FM stereo decoder. - LED indicators for signal-strength, stereo-mono indication. – Multiplex filter for noise-free FM stereo reception. - Audio Mute switch for temporary reduction of apprent sound loudness. - Built-in ferrite loopstick antenna for convenient AM reception. - Stereo inputs to accept any one of the following (Aux): Cassette player/8-track cartridge player/open reel tape player/other high output level (150 mV) sources. - Tape deck inputs and outputs permit connection of any two of the following:
2 or 3 head recorder/playback unit/cassette or cartridge player.
- Previously-selected-frequency memory when the power is reswitched on.

Unpacking

Carefully remove all items from the container and check for damage. Before discarding any of the packing materials, examine them carefully for items you may have overlooked. It will to your advantage to save original carton, fillers, cushonings, etc. They will prove valuable in preventing damage should you ever have to transport or ship your receiver. Accessories contained in original carton are:

Operating manual/replacement fuse/warranty card/convenience FM dipole antenna.

Receiver Installation

Installation of SRC 80 is not complicated. However, the following guidances must be followed for satisfactory performance and to assure full coverage under the terms of warranty.

1. Do not attempt to remove the cabinet cover - there are no user serviceable parts inside the receiver. Refer servicing only to qualified personnel.
2. Make sure that the Power switch is in the **Off** position before making any installation or connections.
3. The receiver and associated equipment may be placed on a table, shelf, or it may be mounted in furniture suitably designed for the purpose.
4. The equipment must not be exposed to excessive dust, moisture, or direct shources of heat.
5. If mounted where ventilation may be restricted, care must be taken to provide a minimum opening of approximately 50 squere inches of 320 squere cm, for free air movement, in and out of the cabinet to the room.
6. To clean the cabonet, wipe with a cloth soaked in a neutral cleaner or a polishing cloth. Do not use benzine or thinner which will damage the cabinet finish.

Receiver Connections

First, refer to pictorial diagram on first page.

Speaker Connection (Speakers A/Speakers B)
Connect left and right channel main speakers to receiver terminals marked **A**. Use suitable gauge wire. For wire lengths of less than 20 feet or 6 meter, 18 gauge wire is recommended. For longer distances, 16 gauge wire should be used. This is necessary to avoid power loss and to maintain

good control or damping of the loudspeaker. Use care not to shortcircuit speaker cables. Phase properly. That is, connect the **positive (plus)** terminal on each speaker to the corresponding **positive (plus)** on the receiver. The **minus** terminals are likewise connected together. This insures that speaker cones are working together and not against each other, providing optimum imaging and best bass response. Take care to connect left and right speakers to the proper channel. In the same manner, a second pair of speakers may be connected to the **Speakers B** output terminals.

Phono Turntable/Changer (Phono)
Use cables provided with turntable, or obtain insulated and shielded audio cables terminated with standard pin plug. Make proper channel connection to Phono MM or MC input jacks depending on the condition of your turntable. Connect separate ground lead to receiver **Ground** terminal. Connect turntable power plug to wall outlet.

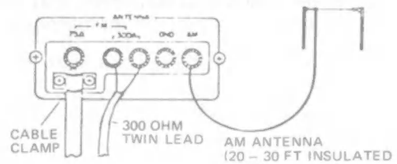
Auxiliary Equipmant (Aux)
Use insulated and shielded audio cables, terminated with standard pin plug. Connect to **Aux** input jacks. Make proper channel connection. Connect auxiliary equipment power plug to wall outlet.

Tape Deck (Tape I Rec/Play/Tape 2 Rec/Play)
Connect output of main tape deck to **Tape I Play** jacks and tape deck's input to **Tape I Rec** jacks. Use insulated and shielded audio cables. Connect tape deck power plug to wall outlet. A second tape deck may be connected to **Tape 2 Rec and Play** jacks. Use cables and make connections as above.

Receiver Power Suplly
Plug the cord set into the wall outlet supplying voltage and frequency of 220 volt and 50 Hz. Before making power plug connection, make sure that the **Power** switch is in the **Off** position.

Important Notice: The model SRC 80 has been equipped with a microprocessor programmable computer memory circuit which can store 7 AM and 7 FM (14 in all) frequencies to enable you to select desired station by a touch of **Preset** pushbuttons directly. To protect stored memory informations always to be alive, the power plug from the receiver must not be disconnected from the wall outlet even while the receiver is not being used. So please turn off the receiver only by the **Power** switch and not by the disconnection of the power plug from the outlet. Failure to observe this may let all memory informations be lost.

Antennas



75 OHM COAXIAL CABLE

1. Remove approx 32 mm of outer insulation from cable.
2. Remove all but 9.5 mm of the shield braid.
3. Remove inner insulation,leaving 5 mm of the insulation exposed. The center conductor should be approx 13 mm long.

Ferrite loopstick antenna
The ferrite loopstick antenna is a sensitive pickup element of the AM receiver section. For maximum station pickup, it must be propely positioned away from the rear chassis and other metallic surface. The assosiated connecting cables and AC power cord should be dressed as far away as possible. For optimum performance, the antenna should be positioned for maximum signal strenght when the unit is tuned to the desired station. Use signal strenght indicator for reference.

External AM Antenna
AM external antenna terminals are provided for a properly designed longwire AM antenna system. Such antennas are useful when the desired AM station are at a considerable distance from the receiver. A simple longwire antenna can consist of a lenght of single conductor insulated wire of 30 feet or 9 meters or longer, extending from the receiver antenna termina to the outside of the building. This wire should be positioned away from electrical cables and appliances. As a rule, the longer and higher the antenna the better the reception.

Supplied 300 Ohm FM Dipole Antenna
An FM dipole antenna is supplied with your new receiver. In strong signal area, this should be more than adequate for reception of most FM stations. Antenna connections are made to the terminal strip marked **Antenna-FM-300 Ohm** located on rear chassis. The dipole leads are connected to the screws marked **300 Ohm**. The **Ground** csrew is not used for the dipole antenna. The dipole antenna should be unfolded to its full 'T' type size and oriented for optimum performance. Dipole antennas are most sensitivie to FM station when positioned perpendicular to station. The antenna is correctly positioned for best reception when the signal strength indicator on the front panel reads maximum.

External FM Antenna (300 Ohm)
For fringe (weak signal) areas, or areas where interference to FM reception is high, the use of logperiodic, or Yagi antenna system is recommended. These antennas are directional and high gain nature, thus tending to reduce most interference due to reflected signals (multipath distortion) and ignition noise. In areas where stations are located in different directions from the point of reception, the antenna must be repositioned for optimum reception of individual stations. For this reason, a good quality rotor is suggested. To minimize the introduction of multipath distortion and ignition interference by the antenna lead-in cables, the use of shielded 300 ohm (twin-lead) cable is recommended.Unshielded twin-lead is suitable where the lead-in wire length from the antenna is short, and when used it should be twisted at the rate of 1 to 2 turns per foot. Long lead-in wires can act as omnidirectional antenna and can cancel the advantages of directional antenna systems. Unshielded twin-lead is also more susceptible to ignition noise than shielded cable. Shielded 300 ohm cable consist of two inner signal conductors with an outer shield. An insulating jacket is also provided, covering the shield. The two signal conductors are conncted to the screws marked 300 Ohm and the shield is connected to the screw marked **Ground**.

Exterior FM Antenna (75 Ohm)
A second antenna teminal is provided for connecting an unbalanced 75 ohm antenna cable. These terminals should be used whenever a 75 ohm coaxial cable is used as a lead-in from the antenna. The braided outer conductor is held under the clamp. Refer to connection diagram on page 2 for proper cable preparation and hookup. This type of lead-in offers th same advantages as shielded 300 ohm cable by minimizing interference picked up by the lead-in cable.

Control Functions

1. **Power Switch (Power)**
   Turns the receiver on when depressed. The memory back-up circuit will not turned off by this switch. The power LED should now light up.

2. **Stand-By Indicator**
   Lights up to indicate that the memory circuit is connected to power source when the **Power** switch is off.

3. **Headphone Jack (Phones)**
   Accepts plug from a stereo headset for private listening. Since the signal is always fed to this jack regardless of the **Speakers** switch selection, it is recommended that the haedphones be disconnected when not in use to avoid possible overload.

4. **Speaker Switches (Speakers A/B)**
Permits you to select a listening condition. Depressing the switch connects the sound output to the speakers connected to speaker output terminals characterized by letter **A or B**.

5. **Tone Controls (Bass/Treble)**
The controls allow you to adjust the tonal blance of the sound output. **Bass**, Increases or decreases the level of the low frequencies in the program material. Clockwise rotation increases and counterclockwise rotation decreases. **Treble,** Operates in the same manner as the **Bass** tone control except it provides adjustement of high frequency levels.

6. **Input Selector**
Selects the program source, provided that the both **1 and 2 Tape Monitor** pushbuttons are set to released position. **AM**, Selects AM reception. **FM,** Selects automatic FM stereo reception. **FM MPX Fil**, Activates a circuit which reduces high frequency noise in weak FM stereo reception. This filter does not affect frequency response but reduces slighly the high frequency stereo separation. **Phono (MM)**, Selects the outputs of stereo turntable connected to the **Phono MM** jacks. The turntable should be equipped with moving-magnet (MM) type phono cartridge. **Phono (MC)**. Selects the outputs of stereo turntable connected to the **Phono MC** jacks. The turntable should be equipped with moving-coil (MC) type phono cartridge. **Aux**, Selects the program source connected to the **Aux** input jacks.

7. **Filters (Lo Fil/HI Fil)**
These filters are used to remove low and high frequency noise from various program materials. **Low-frequency filter (lo Fil)**, Filters out the very low frequencies below 40 Hz. This can be particulary useful when a turntable produces undesirable low frequency signals caused by rumble, record warps or acoustic feedback from loudspeakers. Although these frequencies may not be audible, they can result in excessive movement of woofer cones causing intermodulation in the loudspeaker. This filter can be left in **On** position at all times with no ill effect. **High-frequency filter (Hi Fil),** This filter is used to remove high frequency noise sometimes encountered in program materials. Such noise might be experienced when playing a worn record or a tape having excessive hiss. Since all high frequency filters have some effect on the high frequency response of the program material, they should not be used unless disturbing high frequency noise is present.

8. **Loudness Contour (Loud)**
When depressed, compensates for deficiencies in human hearing ability at low listening levels depending on the Fletcher-Munson curves. That is, audio levels of high and low frequencies are boosted.

9. **Stereo-Mono Swich (Stereo/Mono)**
Determines the manner in which program material will be reproduced through the left and right channels. **Stereo (released)**, Provides stereophonic reproduction of any stereo program source. This setting also provides automatic FM stereo reception. **Mono (depressed),** A program source connected to the left and right channels is mixed and reproduced through both channels.

10. **Audio Mute Switch (Audio Mute)**
When depressed, this switch will automatically reduce the volume of the receiver to a low level regardless of the existing setting of the **Volume** control. This feature enables you to lower the volume temporarily when you find it necessaty to momentarily interrupt your listening to answer a phone etc.

11. **Tape Monitor (Dubbing) Switches (Tape Mon 1/2/Dubbing)**
Selects outputs from tape decks connected to **Tape Play 1 or Tape Play 2** input jacks. The combination of switch settings will also incorporate dubbing feature between tape decks connected to the input jacks. To duplicate a tape from tape deck connected to **Tape 1 Rec/Play** jacks

onto a tape deck connected to **Tape 2/Play** jacks, depress **Tape Monitor 1** switch, while leaving the **Tape Monitor 2** switch released. To duplicate in reverse direction, depress **Tape Monitor 2** switch while leaving **Tape Monitor 1** switch released. The tape dubbing can be done regardless of the **Input Selector** selection.

12. **Balance Control (Balance)**
Provides left to right channel balance of the program material. Normally this control should be set to its center (0) position.

13. **Volume Control (Volume)**
Permits adjustment of volume for left and right channels simultaneously.

14. **Electronic Tuning Pushbuttons**
These 5 pushbuttons will serve for electronic tuning opration and used to tune in AM or FM stations. **Auto/Manual pushbuttons,** determines the mode of electronic tuning – automatic scan (Auto) or manual one-by-one tuning (Manual).
Hold pushbutton, used when automatic scan with the STH pushbutton depressed, to stop the scanning at a frequency you desire. **STH** (Short-time-hold) pushbutton, used when automatic scan so that the receiver will pause on a station for 5 seconds.
Down/Up pusbuttons, (1) when the **Auto/Manual** pusbutton is set **Auto** (released) postition, will start the scanning either upscala or down scala. (2) when the **Auto/Manual** pushbutton is set to **Manual** (depressed) position, each time pressing the either pushbuttons will tune the unit to the next available AM or FM station assignment (50 kHz for FM, 9 kHz for AM) precisely.

15. **Fluorescent Frequency Readout and Mode Indicators**
Digitally indicates the frequency to which the unit is tuned. Also shows mode of reception – AM or FM or memory preset sign.

16. **Mono/Stereo/Signal-strength Indicators**
Stereo, During FM reception, indicator lights up to indicate that the receiver has switched to stereo FM reception. The **Mono** indicator will otherwise light up (except in AM reception).
Signal-stength-indicator, Used for tuning, showing relative signal strength on both AM and FM modes.

17. **Memory Preset Pushbuttons**
Used to preset AM and FM stations for automatic pushbutton selection.

18. **Memory Pushbutton**
Used to preset AM or FM stations into **Memory Preset** pushbuttons.

Receiver Operation

With receiver installed and connected as outlined, set the **Power** switch to **On** (depressed) position.

FM Tuning

Set the **Input Selector to FM**. Set the **Auto/Manual** switch to **Manual** (pressed) position. Press the **Up** pushbutton to tune upscale and the Down pushbutton to tune downscale. Eachtime the either pushbutton is pressed, the unit is tuned to the next available FM station assignment precisely 50kHz away. No fine tuning is necessary. To tune upscale or downscale rapidly, press the either pushbutton and hold it in position. Release the pushbutton when you have tuned to the desired station. If you tune beyond the ends of the scale (87.5 and 108.0) the unit automatically tunes to the opposite end and continues.

AM Tuning
Set the **Input Selector** to AM. Set the **Auto**/**Manual** switch to Manual (pressed) position. Press the **Up** pushbutton to tune upscale and the **Down** pushbutton to tune downscale. Eachtime the either pushbutton is pressed, the unit istuned to the next available AM station assignment precisely 9 kHz away. No fine tuning is necessary. To tune upscale or downscale rapidly, press the either pushbutton and hold it in position. Release the pushbutton when you have tuned to the desired station. If you tune beyond the ends of the scale (531 and 1602) the unit automatically tuned to the opposite end and continues.

Automatic-Scan-Tuning
In addition to the manual station tuning using the **Manual** (depressed) position of the **Auto/Manual** switch, your receiver is equipped with automatic-scan tuning. (1) Set the **Auto/Manual** switch to **Auto** (released) position. Set the **STH** pushbutton to released position. Press the **Up** or **Down** pushbutton. The unit will scan to a station and continue receiving that station. (2) Set the **Auto/Manual** switch to **Auto** (released) position. Set the **STH** pushbutton to **On** (depressed) position. Press the **UP or Down** pushbutton. The unit will scan to a station and pause on it **for 5 seconds.** If you choose to continue listening to that station, press the **Hold** pushbutton (or release the **STH** pushbutton). If the **Hold** pushbutton is not depressed within 5 seconds, the unit will automatically scan to the next station.

Automatic Pushbutton Tuning
Each pushbutton may be present to an AM station and an FM station for automatic pushbutton selection (7 in AM, 7 in FM; for a total of 14 in all). Preset each pusbutton as follows:
1. Set the **Input Selector** to the desired position.
2. Use **Up or Down** pushbutton, etc. to select the desired station.
3. Press the **Memory** switch.(Now the word **Memory** appears in the frequency readout area to indicate that now the unit is ready to accept the memory presetting).
4. Press the pushbutton to set the station (Now the ward **Memoy** should disappear to say memory preset has been completed.)
5. Repeat above steps for each pushbutton. Now you may use the pushbutton to select the station you wish to hear.

FM Stereo Reception
Receiver will automatically switch from mono to stereo FM operation when tuned to an FM stereo broadcast provided that the **Stereo/Mono** switch is set to the Stereo position. Stereo broadcasts are indicated by the illmuninated **Stereo** indicator. When listening to weak stereo stations, placing the **Input Selector** in the MPX Fil position will reduce background noise by cacellation of out of phase noise components. Maximum reduction of background noise on weak stereo stations will be obtained by switching the **Stereo/Mono** to **Mono**. This will, of course, put the system in a monophonic mode of operation.

Using A Tape Deck
Connect tape deck to **Tape I Rec/Play** jacks. To listen to a prerecorded tape, simply play the tape on the tape deck and set the **Tape Monitor I** switch to **On** (depressed) position. To record a stereo program, select the desired program source on the **Input selector.** This will produce a recording signal at both **Tape I Rec** and **Tape 2 Rec** output jacks. If you wish to monitor the program information that is being recorded, set the **Tape Monitor I** switch to **On** (depressed) position.

Using Two Tape Decks
Connect second tape deck to **Tape 2 Rec/Play** jacks. To listen to a prerecord tape, simply play the tape on the desired tape deck and select the appropriate **Tape Monitor** switch to depress. To record a stereo program, select the desired program source on the **Input Selector**. This will produce a recording signal at both **Tape 1 Rec** and **Tape 2 Rec** output jacks. If you wish to monitor the program information that is being recorded, simply depress the appropriate **Tape Monitor** switch. Depressing both **Tape Monitor 1** and **Tape Monitor 2** switches simultaneously will select only the program information that is being recorded onto the second tape deck to be monitored.

Using the Dubbing System
In order to duplicate a tape from tape deck connected to **Tape 1 Rec/Play** jacks onto tape deck connected to Tape 2 **Rec/Play** jacks, perform the following:
1. Make sure the inputs and outputs of both tape decks are connected to the tape input and output jacks properly.
2. Depress the **Tape Monitor 1** switch while leaving the **Tape Minitor 2** switch released.
3. Play the tape on tape deck connected to **Tape 1** input and output jacks and record it on tape deck connected to **Tape 2** input and output jacks. Now the output of tape deck connected to **Tape 1** input and output jacks is being fed to tape deck connected to **Tape 2** input and output jacks.

During the duplicating process , it is possible to monitor the output from tape deck connected to **Tape 1 Rec/Play** jacks.

In order to duplicate a tape from tape deck connected to **Tape 2 Rec/Play** jacks onto tape deck connected to **Tape 2 Rec/Play** jacks, perform the following:
1. Perform same step as above 1).
2. Depress the **Tape Monitor 2** switch while leaving the **Tape Monitor 1** switch released.
3. Play the tape on tape deck connected to **Tape 2** input and output jacks and record it on tape deck connected to **Tape 1** input and output jacks. Now the output of tape deck connected to **Tape 2** input and output jacks is being fed to tape deck connected to **Tape 1** input and output jacks.

During the duplicating process in the case, it is possible to monitor the ouput from tape deck connected to **Tape 2 Rec/Play** jacks.

Trouble Shooting Guide

The following guide is intended as an aid in correcting problems encountered when setting up the stereo system. Although the suggested remedy might seem quite elementary it may be sufficient to make corrections without returning the receiver to your dealer.

Problem	Suggeted Remedy
Receiver inoperative when power is switched on	1) Check power fuse. Refer to rear panel for proper replacement. 2) Be sure power cord is properly connected to power outlet having the voltage and frequency of 220 volt and 50 Hz.
Indicator lights up but no output any mode of operation.	1) Check speaker cables for loose or shorted condition. 2) **Check Speakers** switches for proper speaker selection. 3) Check **Tape Monitor** switches for proper setting.
No output one channel.	1) Refer to above. 2) Exchange speaker cables to determine if problem is in speaker or cables. 3) If phono only, check phono leads and cartridge connections. 4) Interchange phono cables to input jacks to check whether the same channel remains inoperative.
Scratchy or noisy phono sound	1) Lift tone arm, if the noise stops, the problem probably originates in the cartridge or associated wiring. Repair and/or replace as indicated. 2) Connect ground wire between changer mechanism and receiver Ground terminal (when supplied with turntable or changer).

Hum, phono only	1) Be sure phono cable plugs are fully inserted in receiver jacks. 2) Move phono cable plugs around while listening to program to reveal an intermittent or broken shielded lead. Repair or replace. 3) Connect ground wire as noted above.
Hum, other inputs.	1) Check cables and connections. 2. Reverse receiver power plug. 3) Reverse associated equipment's power plug.
Weak AM reception.	1) Position AM loopstick antenna for maximum station pickup. 2) Locate receiver away from metallic surface. 3) If building construction uses aluminium foil faced insulation, metal lath, or steel framing, AM reception will be poor. 4) Install an external AM antenna.
Weak FM reception.	1) Check all external antenna connections. 2) Instal a properly designed antenna. 3) Position receiving antenna for maximum signal.
Noisy AM reception.	1) Usually caused by electrical appliances within building, or automobile ignition. 2) Use commercial noise filter on appliances. 3) Install external AM antenna. 4) Locate receiver as far away as possible from television receiver. 5) Locate external AM antenna as far away as possible from interfering soures. 6) Install proper earth ground.
Noisy FM reception.	1) Install external antenna. 2) Use shielded lead-in wire. 3) Install proper earth ground. 4) Rotate antenna for maximum signal. 5) Connect power line noise filter to interfering appliance.

Circuit Description

Tuner Circuits

1. PLL Frequency synthesizer circuit

A PLL frequency synthesizer system has been employed in the FM and AM tuner section of the amplifier to perform electronic tuning operations such as automatic station scanning, memory station tuning, etc. The synthesizer system consists of several circuits and generates local oscillator frequencies instead of a conventional local frequency oscillator. In the conventional local oscillator, a variable tuning capacitor is used to vary its oscillating frequency, but in the synthesizer system a varicap diode is used to control the oscillating frequency of a VCO (voltage controlled oscillator), and the VCO functions as the conventional local oscillator.
Now, the description on the frequecy synthesizer circuit will be given in detail.

A. FM Frequency Synthesized Local Oscillator

The VCO is comprized of the transistor Q3, resonant circuit including T4, CT3, C22, C23 and a variable capacitor diode D3, the capacitance of which is varied by the DC voltage applied to its cathode (namely the oscillating frequency is varied by the DC voltage applied to the cathode). The VCO is always controlled to oscillate at 10.7 MHz higher frequency than the selected receiving frequency. Thus controlled and generated frequency is injected to the mixer base of Q2 through a coupling capacitor C13.
The frequency control will be made as follows:
The VCO output is applied to the prescaller circuit (pin 7 of IC U1) through the oscillator buffer amplifier Q4 and counted down to a lower frequency with the 1/20 DOWN counter inside the IC, because the VCO frequency is too high to be handled in the PLL circuit. Thus converted VCO frequency is led to the programmable counter (pin 3 of U2) through a buffer amplifier Q5, D4, C17, and again counted down to another low frequency (2.5 kHz) according to the instructions from the 4 bit microprocessor in which frequency control program is stored. The low frequency is finally led to the comparator in the PLL IC U2. On the other hand a reference crystal oscillator of 11.520 MHz is provided in the U2. The reference frequency is also divided into a low frequency (2.5 kHz for FM, 9 kHz for AM) and led to another comparator input terminal. Both frequencies applied to the comparator are compared in their phase in the comparator, and the comparator provides an error signal at its pin 10 if the comparator detect the phase error between the two input frequency signals. The error signal is led to a lowpass filter consisting of Q5 and Q4 to eliminate undesired noise components included in the error signal. Thus filtered DC error signal is finally applied to the varicap diode D3 through R19 and D1 and D2. (D3 varies oscillator frequency, D1 and D2 vary receive frequency.) The error signal varies D3 capacitance until the oscillating frequency becomes to the frequency predetermined or programmed by the microprocessor. And once the predetermined frequency is established, the error signal becomes to zero and the varicap diode stops its capacitance change, thus the VCO frequency is locked to the predetermined frequency.

B. AM Frequency Synthesized Local Oscillator

The AM local oscillator (VCO) circuit is completely integrated inside the AM tuner IC U1 except a few associated components such as the tuning coil and capacitors. Inc ase of the AM frequency synthesizer, the VCO signal is directly applied to the PLL IC input circuit pin 3 through a buffer amplifier Q3 and a diode D3 (MA150), no prescaller is used because the VCO frequency is not so high. The AM VCO frequency is then processed in the similar way in case of FM and the resultant DC error signal is applied to the AM oscillator varicap diode D2, and controls the AM tuning frequency or oscillator frequency. Te same filtered DC error signal is also applied to the varicap diode D1 to vary the tuning frequency in the RF tuned circuit.

2. FM Front End

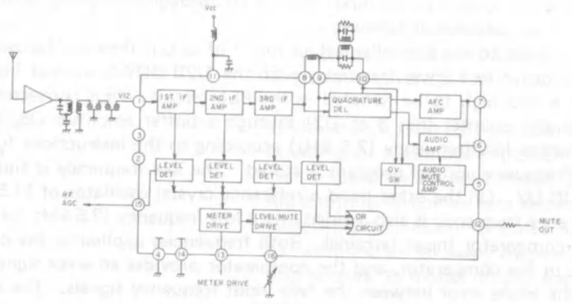
The FM front end section consists of a FET RF amplifier Q1, mixer Q2, VCO Q3, and its buffer Q4. The FET RF amplifier has two tuned circuits, one at its input circuit, and another at its output circuit. Each tuned circuit is equipped with a varicap diode as a tuning capacitor and is controlled by the frequency control signal or filtered DC error signal from the PLL frequency synthesizer IC U2. The RF amplifier Q1 amplifiers the selected signal and applies its output to the mixer base of Q2 through a coupling capacitor C12. While the local oscillator signal or the VCO signal controlled by the PLL IC is injected to the same base of the Q2 through C13. Both signals applied to the base of Q2 are then mixed with each other and heterodyned, and the resultant lower frequency output signal or 10.7 MHz signal is used as IF signal. Connected at the mixer output circuit is a IF transformer T3 to select this lower IF signal. Thus obtained IF signal is then led to the IF amplifier section.

3. FM IF Circuit

The FM IF circuit section consists of one differential amplifier consisting of Q4 and Q5, two ceramic filters, and one IF system IC U2. The system IC U2 contains three stages of IF amplifiers and the amplified output is directly applied to a quadrature FM detector input. The detected audio output or composite signal is led to an audio amplifier inside the IC. Thus amplified final audio composite signal is developed at the pin 6 of the U2. The system IC develops several control signals:

a. The pin 12 develops a positive DC voltage which decreases in level as the IF input signal is increased, therefore the signal is used as a muting control signal.
b. The pin 13 develops a positive DC voltage which increases with increased IF signal input, thus the signal can be used as a signal meter drive, etc.
c. The pin 16 is the terminal which controls the muting threshold level.

Block Diagram of FM IF System IC



4. FM MPX Stereo Circuit

The audio signal (stereo composite signal) obtained at the pin 6 of the FM IF IC U2 is directly applied to the pin 2 of the FM MPX stereo decoder IC U4 through C38 and R44 and decoded into two channel signals. The decoded left and right channel signals are developed at the pins 7 and 6, respectively.

The stereo/mono switching will be achieved as follows:

As previously stated the pin 12 of the system IC U2 develops a positive DC voltage which decreases with increased IF input signal. Therefore, under no signal or low signal level condition the pin 12 develops a high level DC output. The high level DC voltage is applied to the inverter input (pin 7 of U3) and its inverted output or low level DC is obtained from the pin 6 of the same IC. The low level output is then applied to the base of the transistor Q14, but the transistor is not turned on because of its low level base input. Therefore a high voltage is applied to the pin 16 of the MPX IC U4 through the resistors R79 and R81. Since the U4 is designed to operate in monaural mode when a voltage higher than 1.4V is applied to its pin 16, the MPX circuit in the U4 does not operate in stereo mode under no signal or low level signal input (stereo threshold level) condition.

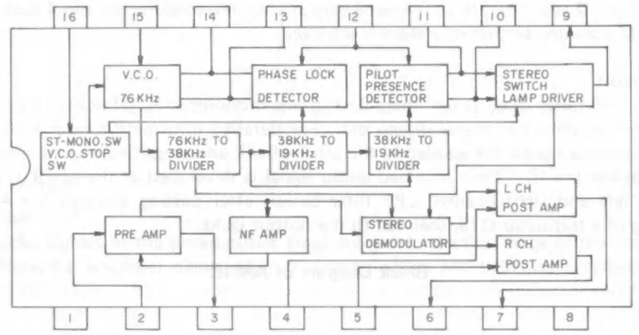
Next, when the IF input signal (or FM antenna signal) is increased to a certain level higher than the stereo threshold level, the DC output from the pin 12 decreases. Then the inverter output at the pin 6 of U3 increases and this increased voltage makes the transistor Q14 turn on. Namely the collector of the Q14 is grounded through the stereo/mono switch. Then the voltage at the pin 16 of U4 lowers and the U4 stereo decoder starts to operate. The semi-fixed resistor RV5 connected to the pin 15 through R84 is used to adjust VCO frequency, and the RV6 connected across the pin 4 and 5 is used to adjust stereo separation. Thus produced each left and right channel output is then fed to the low pass filter consisting of L4, L6, etc. to eliminate undesirable frequencies such as 19 kHz and 38 kHz switching noises included in the decoded signals, then led to the final buffer amplifier Q19.

Thus amplified stereo outputs are led to the output jacks through two stages of muting circuits (Q19 and Q21). The muting circuits operate to short out the audio signals or noises which would be caused during station scanning or any other logic operations of the controller IC or microprocessor.

(Stereo/Mono Indicator Switching)

The pin 9 of the stereo decoder IC develops a low voltage during stereo mode of operation or a high voltage during mono mode operation, and the voltage is used to make the stereo/mono LEDs turn on or off. When FM antenna signal higher than the stereo threshold level is applied to the antenna circuit, the pin 4 of the IC U3 becomes low, and this makes Q11 conductive, (namely, common circuit for the stereo and mono LEDs is closed.) On the other hand if the U4 operate in stereo mode, the pin 9 develops a low output, then the stereo LED will turn on. But if the pin 9 develops a high output, the transistor Q15, the base of which is connected to the pin 9, is turned on, then the cathode side of the mono LED is grounded through collector-emitter of Q15, thus the mono LED will be turned on.

Block Diagram of MPX Stereo Decoder IC



5. FM Muting Circuit

The tuner has equipped with two kinds of muting circuits to assure noise free reception.

(Scanning Noise Muting)

Since the tuner has been equipped with an automatic station scanning system. Undesirable scanning noises may be heard if no muting circuit is provided.

During scanning mode of operation, the controller IC U1 (MN1400ZS) provides an H level signal at its pin 3. The H level signal is applied to the base of Q16 through the Auto (Scanning) Manual tuning switch. As previously stated, if the transistor Q16 is turned on, all four transistor Q21 through 24 are turned on, so no audio output or noise output can be developed at the OUTPUT jacks. (During AM scanning operation the controller IC also develops the H level signal at the pin 3, thus the same muting operating is achieved.)

(Inter Station Noise Muting)

In the event of a low IF input or low antenna input signal, the pin 12 of the IC U2 develops a positive high voltage, and the voltage is applied to the two stages of inverter (pin 7 through 4 of IC U3). Therefore the output voltage obtained at the pin 4 is also H level. Since the H level output is connected to the pin 21 of the controller IC U1, the controller develops H level output at its pin 3. (The controller is designed to develop H or L levels at its pin 3 when the pin 21 is set to H or L level, respectively). As previously described, the pin 3 is connected to the base of Q16, the Q16 is turned on and this makes all transistors Q21 through 24 turn on, thus resulting in short-out the inter station noises.

6. Scan Stop Signal

To secure good scan stop accuracy, the scan stop drive signal must be narrow, sharp, characteristic with its center coincided with that of the IF bandwidth. This will be conducted as follows:

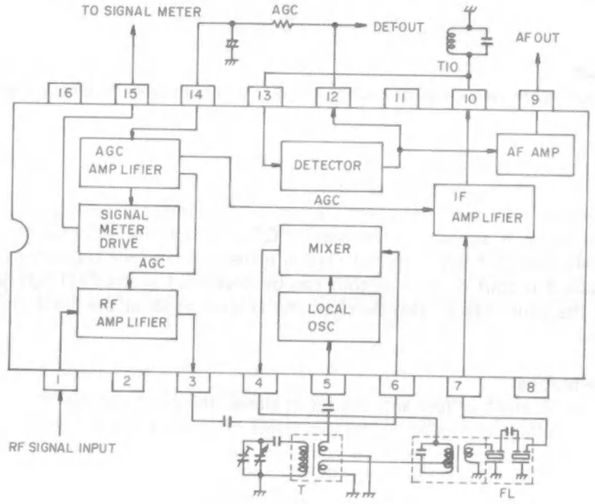
As already described, during scanning operation, pin 3 of U1 develops an H level voltage, and this is applied to the base of Q7 and makes it conductive, then the FET Q6 is cut off and the resistor R43 connected across the FET is directly connected to R42 in series. The increased resistance (R42 + R43) makes final IF bandwidth sharp and narrow for accurate scan stop operation.

If a station is picked up during scanning operation, the muting control signal output developed at the pin 12 of the U2 decreases to the L level. The L level signal is applied to the inverter input pin 7 of the U3 and the inverted output is once again inverted with the next inverter, so the second inverter output pin 4 of the U3 has the same phase as that of the input to the first inverter, namely the output is L level. The L level voltage is connected to the pin 21 of the controller IC U1 and the controller makes the scanning operation stop, at the same time the controller also makes the voltage at the pin 3 decreases to L level thereby to release the muting operation, when its pin 21 is set to the L level.
In the event of AM reception, a fraction of IF output signal is sampled from the AM IF transformer T3 through the coupling capacitor C24 and further amplified by a narrow band ceramic filter amplifiers consisting of the two stages of amplifiers provided between the pin 9 and 10 and the pin 11 and 12 of the IC U3. The amplified output is rectified by diodes D11 and D12, and the output is led to the inverter provided between the pin 14 and 15 of the same IC. A transistor Q12 also operates as an inverter, the collector of which is connected to the last inverter provided between pin 3 and 2. The output developed at the pin 2 will operate in the same way as that developed at the pin 4 during FM reception. Thus accurate AM scanning station operation is achieved.

7. AM Tuner Circuit

The most of the AM tuner circuits are integrated in one monolithic IC U1 consisting of a RF amplifier, local oscillator mixer, detector, meter driver, etc. For detailed information refer to the block diagram shown below. Antenna signals are applied to the pin 1 of U3, and amplified, mixed, amplified, detected, then amplified inside the IC. Thus obtained audio signal is developed at the pin 9 of the same IC, and applied to each left and right channel LPF filter circuit after passing through the AM audio muting circuit consisting of a transistor Q13, then led to the output jacks.

Block Diagram of AM IC



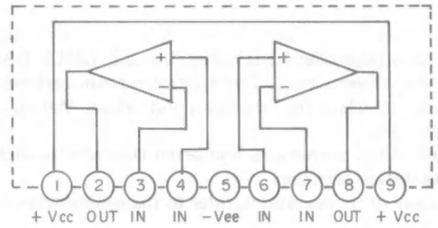
8. Signal Meter Circuit

a. The AM Signal meter drive voltage developed at the pin 15 of the AM system IC U1 is applied to the meter amplifier consisting of Q9 and Q10.
b. The signal meter drive voltage developed at the pin 13 of the FM IF system IC U2 is also applied to the base of Q9 through a meter deflection trimming resistor and a diode D21.
c. The amplified DC output developed at the collector of Q9 drives the LED short-out transistor(s) Q1 through Q5 in the LED signal meter drive circuit, thus indicating the signal strength being received in the tuner.

Preamplifier Section

The preamplifier section of the unit consists of: low level amplifiers each consisting of two stages of complementary amplifiers; RIAA equalizing amplifiers which are comprised of one IC U5 (NJM4559); and tone amplifiers comprised of two stages of operational amplifiers (U1 and U2, AN6551). The internal block diagrams of the IC will be given below for your reference.

Block Diagram of U1 & U2



Power Amplifier Section

1. Power Amplifier

The amplified audio signals in the preamplifier stage are led to the first stage of the amplifier Q1 which consists of a differential amplifier packaged in a same substrate and provides excellent common mode rejection and low DC offset. The amplified signals developed across each collector resistor of R7 and R9 are fed to respective base of the second differential amplifier consisting of transistors Q3 and Q5. The second stage differential amplifier outputs developed at the collector of Q5 is split into two; one is directly applied to one half of the complementary amplifier consisting of Q13 and Q3, and another half is supplied to the remaining half of the amplifier consisting of Q11 and Q1 through the bias temperature compensating circuit comprised of RV1, RV63, R61 and Q5 (circled by a dotted line). The trimming pot RV1 is used to adjust so called idling current of the power amplifier transistors to reduce crossover distortion. Each half of the complementary amplifier (darlington pairs of Q11/Q1 and Q13/Q3) operates for a negative and a positive half swing of the Q5 output voltage, respectively, but provides no voltage gain, because the circuit is connected in a configuration of an emitter follower. Thus amplified final audio output signals are developed at the junction of emitter resistors of R37 and R39 and applied to the speaker output circuits through the speaker protector switching relay contacts.

2. Speaker System Protector Circuit

The protector circuit monitors undesirable DC voltage developed between the speaker output terminals and cuts off the speaker systems from the speaker terminals when a predetermined level of DC voltage is sensed.
In operation, assure a negative DC voltage is developed between the speaker terminals due to DC offset in the differential amplifier stages or any other circuit failures the negative DC appears at the cathode side of the diode D15, then the base bias current of the Q15 will flow through the route of R53, emitter and base of the Q15, and this makes Q15 conductive, which in turn makes Q16 conductive. Since the Q16 collector is connected to the base of Q17, the Q17 is turned off as the Q16 is turned on. Then the relay is deenergized and opens the speaker circuits, thus protecting the speaker system from possible damage.
If a positive DC voltage is developed between the speaker terminals, a base bias current flows into the base of Q15 through another route of R52, emitter-base of Q15, and D16, and the Q15 is turned on. Then the Q16 is turned on and Q17 is turned off as in the case where the negative DC voltage is developed. Thus the relay RY1 is deenergized and opens the speaker circuits.

3. Power Transistor Protector Circuit

The protector circuit consists of transistors Q7 and Q9 each base of the transistor, Q7 and Q9, is connected to each emitter resistor of the power transistor Q1 and Q3, respectively, and senses the voltage developed across the emitter resistor. If the emitter voltage at R37, for example, increases excessively for some part failures, the base bias voltage of Q7 increases and this makes the Q7 conductive. Since the collector of Q7 is connected to the base of Q11 through a diode D3, the Q11 base is short-circuited by the collector-emitter junction of Q7, resulting in decreasing the current flows into the Q11 and Q1. Thus the transistors Q11 and Q1 are protected from possible damage due to excessive overdrive. The transistor Q9 also operates in the similar way.

Control Circuit

The control circuit consists of a controller IC U1, PLL LSI U2, CMOS RAM (Memory) U3, Prescaller U1, Frequency Indicator tube drivers, etc. The control circuit performs operation of: Automatic station scanning, Memory station selection, Frequency indication, Muting control during station scanning and any other logic operations.

A back-up voltage is supplied to the memory IC and seven channels for each AM and FM can be stored in the memory for immediate station selection.

For the memory setting and any other operations, refer to the simplified operating instructions included in the manual.

Alignment

1. Measurement conditions

(1) Reference temperature: 25°C
(2) Reference humidity: 65%
NOTE: Unless otherwise specified, alignment may be conducted under the room temperature of 5 – 35°C and the room humidity of 45 – 85%.
(3) Power supply
Voltage: AC 220V ± 1%
Frequency: 50 Hz ± 2%

2. Test equipment

Any test equipment to be used in this alignment should have its known accuracy and capability to operate within a range of specified tolerance described in the electrical specifications. All test equipments to be used should be properly calibrated.

3. Function controls

Refer to instruction manual.

3.1 Standard setting of controls and switches

a) INPUT SELECTOR
Set the selector in accordance with the specified direction.
b) VOLUME/BALANCE
BALANCE: At 12 o'clock position (center click).
VOLUME: Main amplifier adjustment – Maximum, unless otherwise specified.
c) TONE control
BASS/TREBLE: At 12 o'clock position.
d) SPEAKER selector
A: On (depress the 'A' button).
B: Off (release the 'B' button).
e) LOW FIL, HI FIL, LOUD, STEREO/MONO, AUDIO MUTE, TAPE MON 1/2
Release the all buttons.

4. Precaution

For units whose alignment is suspected to be completely upset, following precautions shall be observed before preceding to service:

a) Potentiometer setting: RV-1 and RV-2 on PSMA038 shall be rotated fully counterclockwise. Failure to observe this may, in certain cases, result in final power transistor burn-out.
b) Sight-check/Conduction check: Before starting to service, sight-check thoroughly around the main amplifier transistor basings, B-lines, minus-B-lines. Check for short-circuit due to bridging.

5. Adjustment

Be sure to start adjustment with the main amplifier section, do not short-circuit. Do not leave the main amplifier maladjusted for long time period with power turned on.

5.1 Main amplifier adjustment

1) Connect DC voltmeter across TP-1 and TP-3 terminals on PC board PSMA038.
2) Adjust RV-1 for 25 mV ± 3 mV.
3) Connect DC voltmeter across TP-2 and TP-4 terminals on PC board PSMA038.
4) Adjust RV-2 for 25 mV ± 3 mV.

6. FM section adjustment – Preliminary adjustment

Before starting the adjustment, preset the following frequencies into memory pushbutton. Refer to the operation manual instructions or refer to the following:

Frequencies to be preset, 87.5 MHz,
90.0 MHz,
98.0 MHz,
106.0 MHz,
108.0 MHz,
108.0 MHz,
96.3 MHz.

6.1 Preset memory

1) When the unit is first switched after plugging to AC source 87.5 MHz is turned in the unit and displayed on the frequency readout. Depress the MEMORY pushbutton. Then depress #1 pushbutton.
2) Adjust the TUNING UP/DOWN buttons for above frequency, one after another. Each time you have tuned to desired frequency, depress the MEMORY pushbutton, then depress the MEMORY pushbutton.
   NOTE: The memory informations will stay in the memory even if the AC power is interrupted for about 1 hour.

6.2 PLL local oscillator alignment

1) Connect frequency counter through probe to #8 terminal of IC U-2 (MN6142).
2) Adjust CT-1 for 11.520 MHz ± 100 Hz.
   IMPORTANT: Care should be taken for exact frequency adjustment with CT-1 since this frequency will be reference signal for the PLL circuit.

6.3 Variable capacitor bias adjustment

1) Connect DC voltmeter across #3 terminal and #4 terminal (ground) on PC board PSCZ010.
2) Depress MEMORY pushbutton to tune unit to 108.0 MHz.
3) Adjust CT-3 for 9.6V.
4) Tune to 87.5 MHz.
5) Adjust T-4 for 3.1V.
6) Tune to 108.0 MHz again.
7) Adjust CT-3 for 10.0V.
8) Tune to 87.5 MHz again.
9) Adjust T-4 for 3.1V.
10) Repeat above steps until voltages at both frequencies have come to 10.0V ± 0.1V at 108.0 MHz; 3.1V ± 0.1V at 87.5 MHz.
    NOTES: 1) Use high input impedance type DC voltmeter.
    2) If condition in step (3) is not obtained, perform step (4) first.

6.4 RF amplifier alignment

1) Set the AUTO/MANUAL switch to MANUAL.
2) Connect dual-polarity ('center-pointer') meter across terminals #7 and #10 (across R-42: 6.8 kOhms).
   NOTE: The signal generator to be used in alignments hereafter should have deviation less than ±2 kHz.

6.5 IF amplifier alignment

1) Adjust generator to 98.00 MHz.
2) Tune unit to 98.0 MHz.
3) Adjust T-4 for center reading on center-meter connected above.
4) Reduce the generator output.
5) Adjust T-3 for maximum sensitivity.

6.6 FM front end alignment

1) Adjust signal generator to 90.0 MHz.
2) Tune unit to 90.0 MHz.
3) Connect oscilloscope across output terminal.
4) Adjust T-1 and T-2 in turn for maximum scope display.
   NOTE: Reduce the generator output as the output level increases.
5) Adjust the generator to 106.0 MHz.
6) Tune unit to 106.0 MHz.
7) Adjust CT-1 and CT-2 for maximum sensitivity.
8) Repeat above until no further improvement is obtained.
9) Check sensitivity at 98.0 MHz.

6.7 FM distortion alignment

1) Adjust generator to 98.0 MHz.
   Tune to 98.0 MHz exactly.
2) Tune unit to 98.0 MHz.
3) Check center-meter is reading exact center at RF input level of 65 dBf. Readjust T-4 if necessary.
4) Connect a distortion meter (BEF) to unit output.
5) Adjust T-5 for minimum distortion.
6) Repeat above so that minimum distortion is obtained at center reading of the center-tune meter.

6.8 Muting level adjustment

1) Set the AUTO/MANUAL switch to AUTO.
2) Apply 20 dBf input to unit.
3) Adjust RV-2 on PSTU051 so that audio signal is obtained (squelch is defeated) from output.
4) Reduce signal input to 19 dBf.
5) Rotate RV-2 clockwise slowly until the audio output is muted.

6.9 Multiplex alignment

1) Connect multiplex-signal-generator to unit.
2) Adjust the generator to 65 dBf signal with no modulation.
3) Connect frequency counter across #53 terminal and ground.
4) Adjust RV-5 for 19.00 kHz ± 200 Hz.

6.10 Separation alignment

1) Modulate the generator output with 1 kHz, **left channel** signal. Output level should be 65 dBf.
2) Connect oscilloscope and voltmeter to **right channel** output.
3) Adjust RV-6 for minimum leakage.
4) Modulate the generator output with same condition but on **right channel**.
5) Connect oscilloscope and voltmeter to **left channel** output. Check for minimum leakage on the left channel.
6) If setting RV-6 for minimum leakage on either channel is not give minimum leakage on another channel, find compromise between them.

6.11 Stereo level alignment

1) Apply signal generator output modulated with standard stereo signal.
2) Adjust RV-2 so that the STEREO indicator lights up with 20 dBf generator output.
   NOTE: The STEREO indicator should be completely at 22 dBf signal.

6.12 Signal level alignment

1) Set unit to no signal condition.
2) Adjust RV-4 so that all signal-strength indicators go off.
3) Apply 60 dBf signal to antenna input.
4) Adjust RV-3 so that all LED's light up.
5) Reduce generator signal and check all LED's go off at about 20 dBf.

7. AM alignment procedures – Reference frequency presetting

Preset reference frequencies used in alignment as follows:

Frequencies to be preset: 531 kHz,
603 kHz,
999 kHz,
1404 kHz,
1602 kHz.

To preset memory, refer to instructions in the FM alignment.

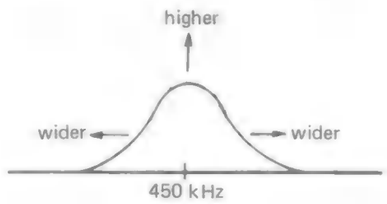
7.1 PLL local oscillator alignment

1) Connect voltmeter across #3 and #4 terminal on PSCZ010 PC board.
2) Tune unit to 1,602 kHz.
3) Adjust CT-2 for 9.0V. (CT-2: on PSTU051)
4) Tune unit to 531 kHz.
5) Adjust T-1 for 1.5V.
6) Repeat above until following voltages are obtained:
   1.5V ± 0.1V at 531 kHz,
   9.0V ± 0.1V at 1,602 kHz.

NOTES: 1) Use high input impedance type voltmeter in this alignment.
2) If condition of step 3) is not obtained, short cut step 3).

7.2 AM IF alignment

1) Set AUTO/MANUAL switch to MANUAL.
2) Connect IF sweep of scope to #12 terminal of U-1.
3) Connect IF sweep output to antenna terminal.
4) Adjust T-2 and T-3 so that following wave shape is obtained.



Check that the marker signal is at center (450 kHz). Avoid overload condition by reducing the IF sweep output to proper level.

5) Adjust T-2 and T-3 symmetrical wave shape with maximum amplitude.

7.3 AM sensitivity alignment

1) Set AUTO/MANUAL switch to MANUAL.
2) Dress bar antenna away from rear chassis.
3) Connect loop-antenna across signal generator output terminal. The loop antenna should be located about 20 to 30 cm (about 7-3/4 to 11-3/4") from the unit bar antenna.
4) Connect VTVM (or level meter) and oscilloscope to receiver output.
5) Set the signal generator frequency to 603 kHz.
6) Tune unit to 603 kHz.
7) Adjust bar antenna core for maximum sensitivity.
8) Set the signal generator frequency to 1,404 kHz.
9) Tune unit to 1,404 kHz.
10) Adjust CT-1 for maximum sensitivity.
11) Repeat above for maximum sensitivity and until no further improvement is obtained.
12) Check sensitivity at 999 kHz.

7.3 Signal strength meter alignment

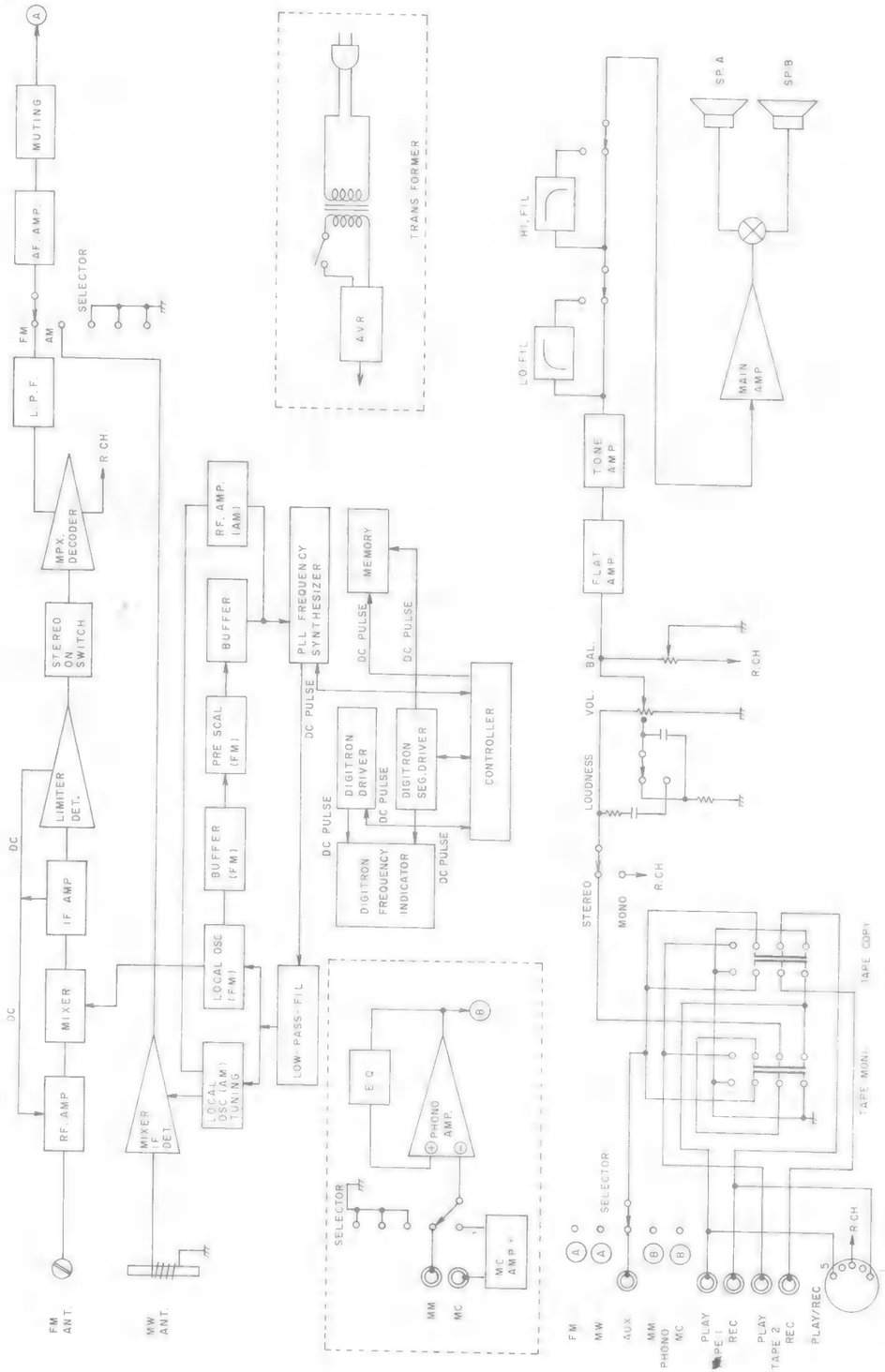
1) Set the signal generator output to 80 dBu.
2) Check all 5 LED's light up.
3) Remove signal generator output.
4) Check all LED's go off.

7.4 Scan-stop alignment

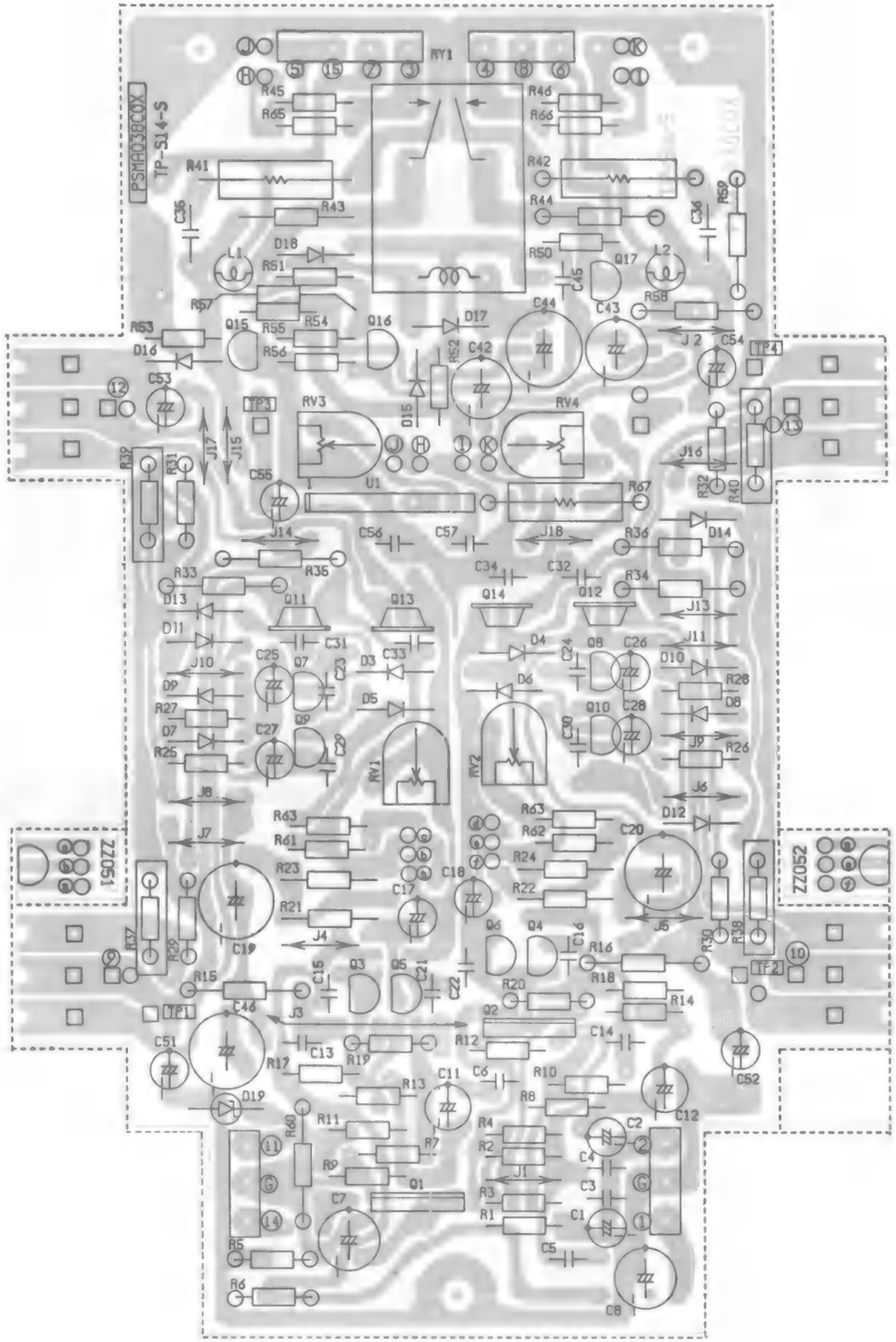
1) Set AUTO/MANUAL switch to AUTO.
2) Set the signal generator frequency to 999 kHz, modulated with 400 Hz audio by 30%.
3) Place the loop antenna connected across the generator output terminal 60 cm (23-3/4") from the unit bar antenna.
4) Set the generator output to 60 dBu.
5) Rotate RV-1 counterclockwise fully.
6) Tune unit to 999 kHz.
7) Rotate RV-1 clockwise so that clear sine-wave appears on scope at receiver output.
8) If RV-1 is rotated too far clockwise, perform from step 5).

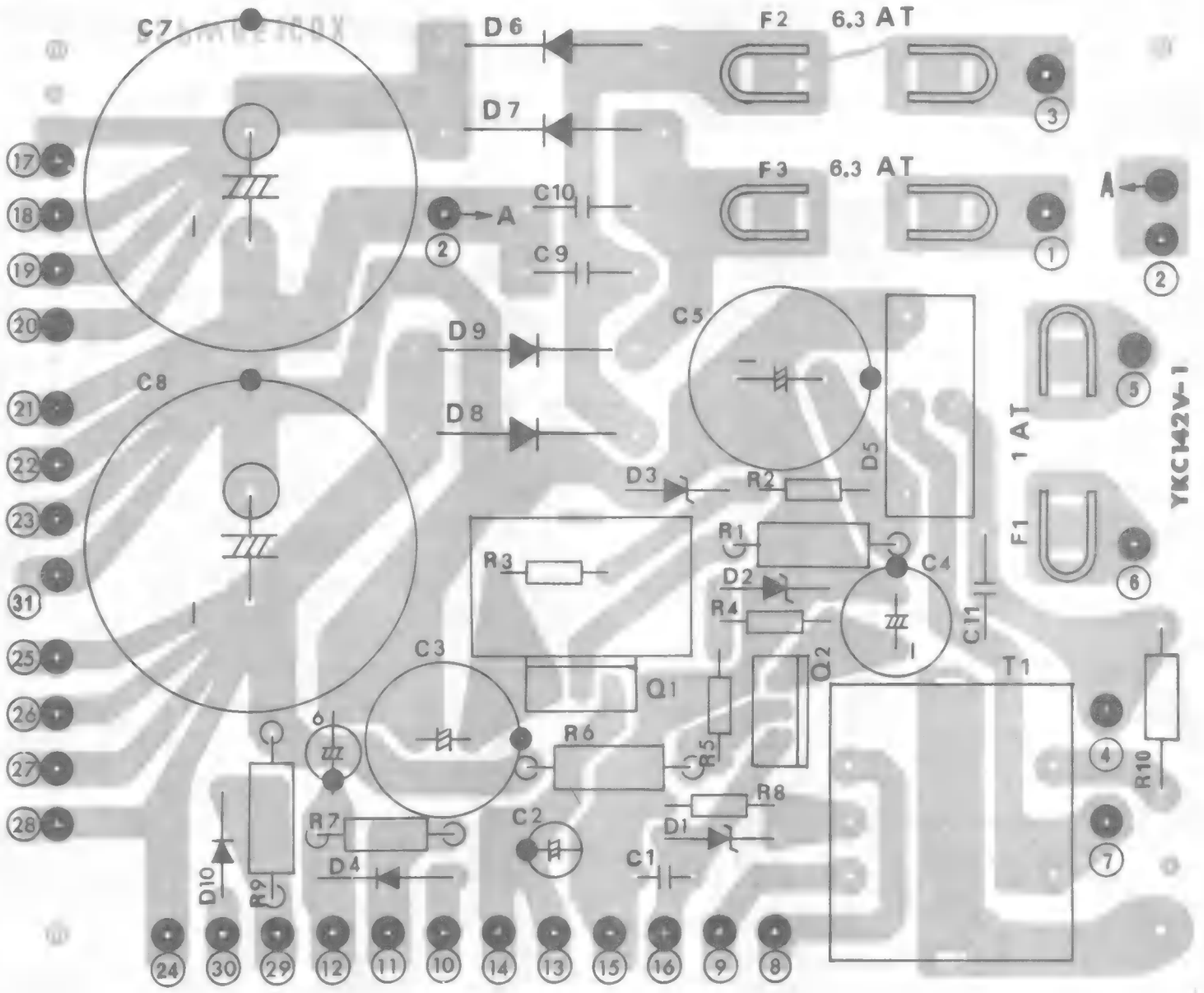
NOTE: The signal generator output frequency should exactly be adjusted to 999 kHz. Tolerance within ±100 kHz is acceptable. Even though the audio signals could be appear in receiver output, the automatic-scan may not stop. Since the scan-stop level is greatly affected by modulating frequency and modulation depth, care should be taken to observe 30% modulation with 400 Hz condition of the generator modulation. Once the scan-stop order (squelch signal) is detected, the scan-stop will not be released again.

Block Diagram



PC

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C8
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D7
D9
D8
F2 6.3 AT
F3 6.3 AT
C10
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R3
D2
R4
C4
C11
F1 1 AT
YKC142V-1
C3
Q1
Q2
T1
R6
R5
R8
R10
R7
D1
C2
C1
D4
D10
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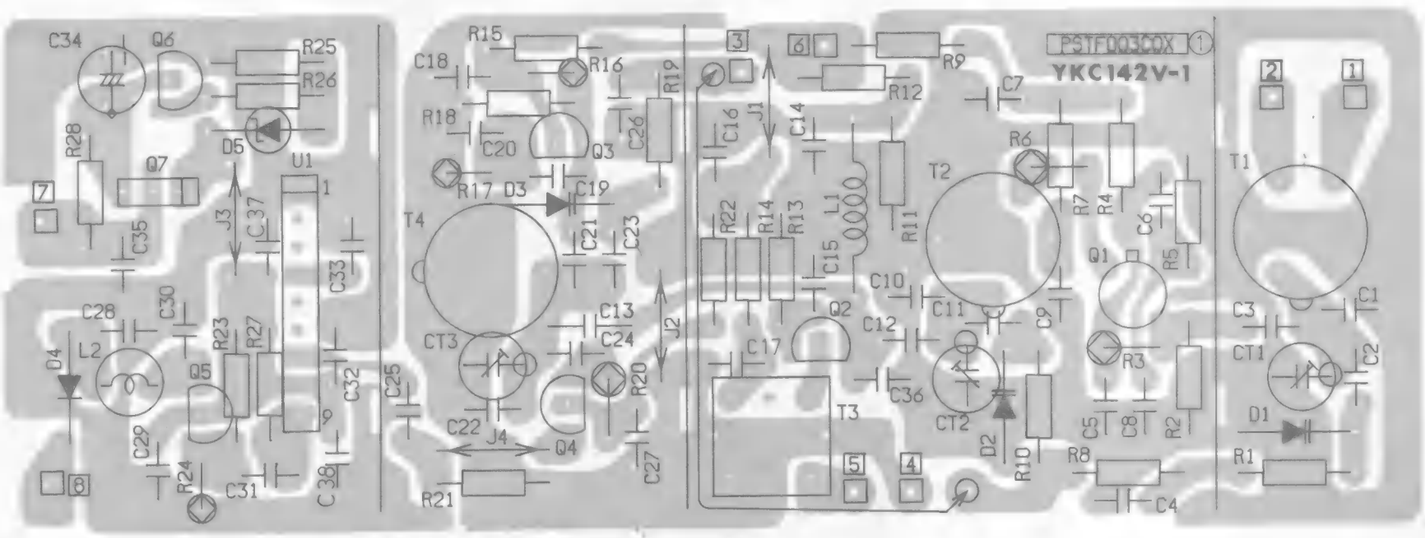
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Q6
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L2
D4
Q5
C32
C25
C29
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C18
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C20
Q3
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J4
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C6
R5
Q1
R3
R2
C5
C8
D2
R10
R8
C4
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C15
Q2
R11
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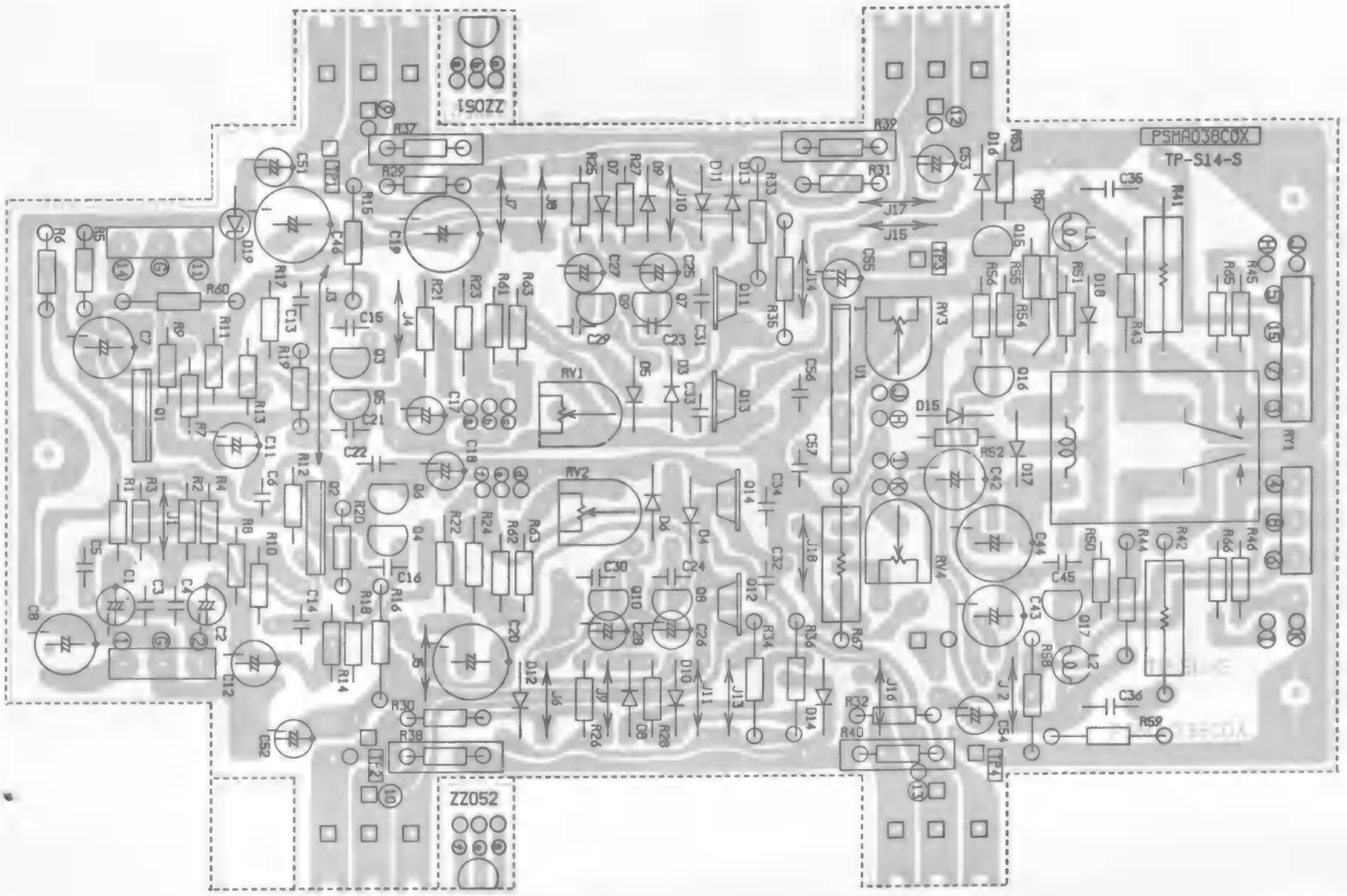
PSMA038C0X
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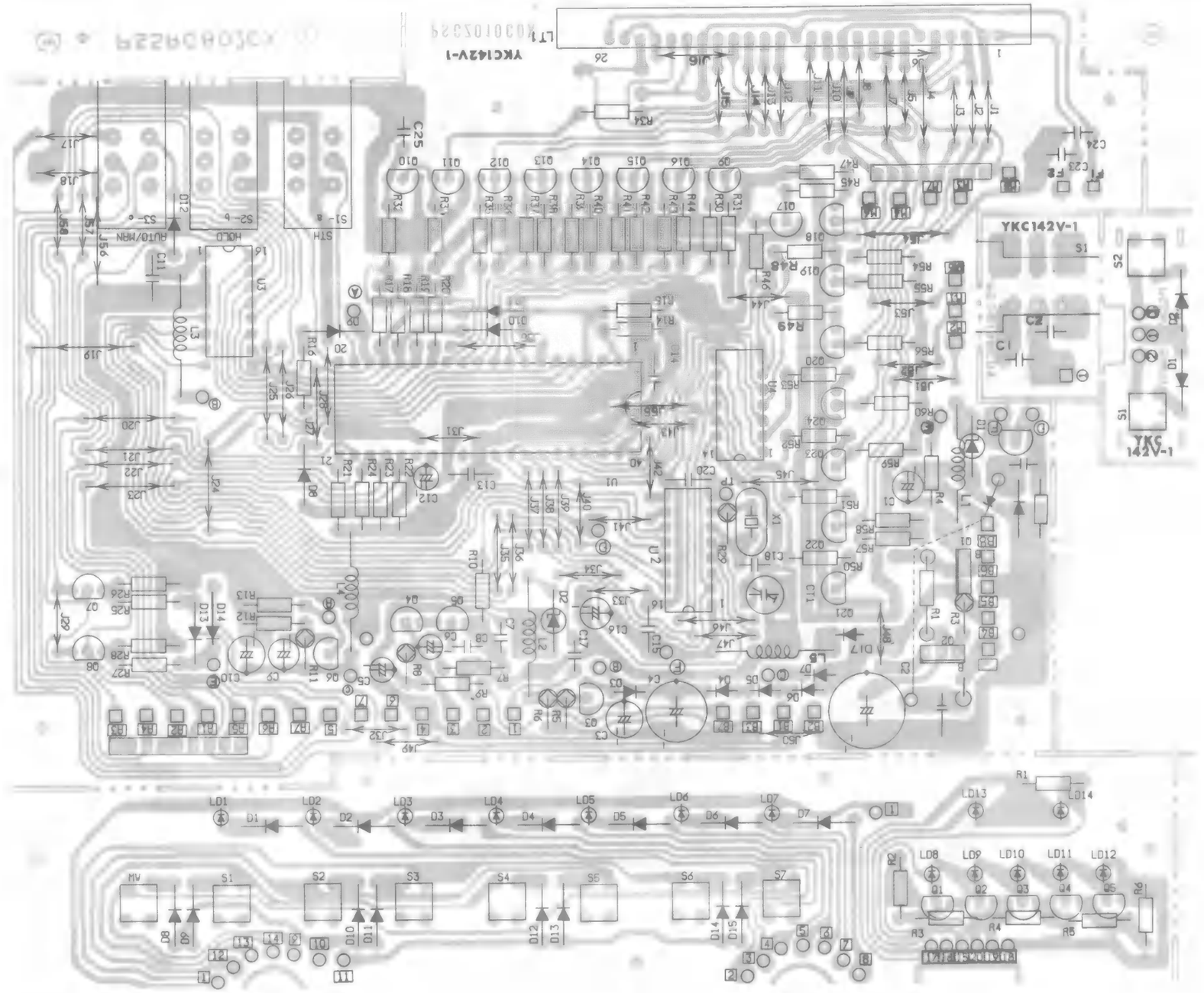
ZZ051
ZZ052


YKC142V-1
YKC142V-1
LD1
LD2
LD3
LD4
LD5
LD6
LD7
LD8
LD9
LD10
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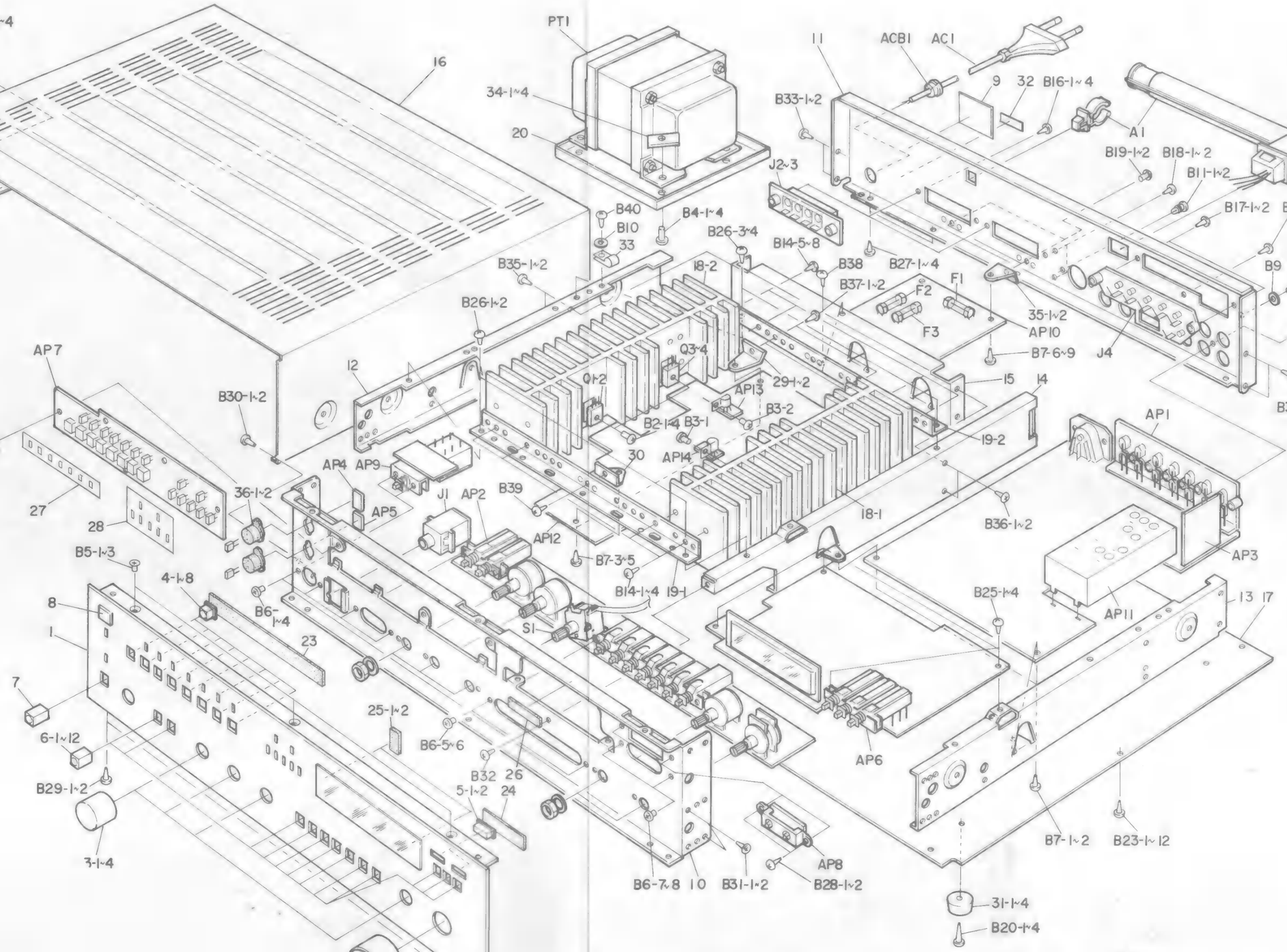
LD12
LD13
LD14
S1
S2
S3
S4
S5
S6
S7
MV

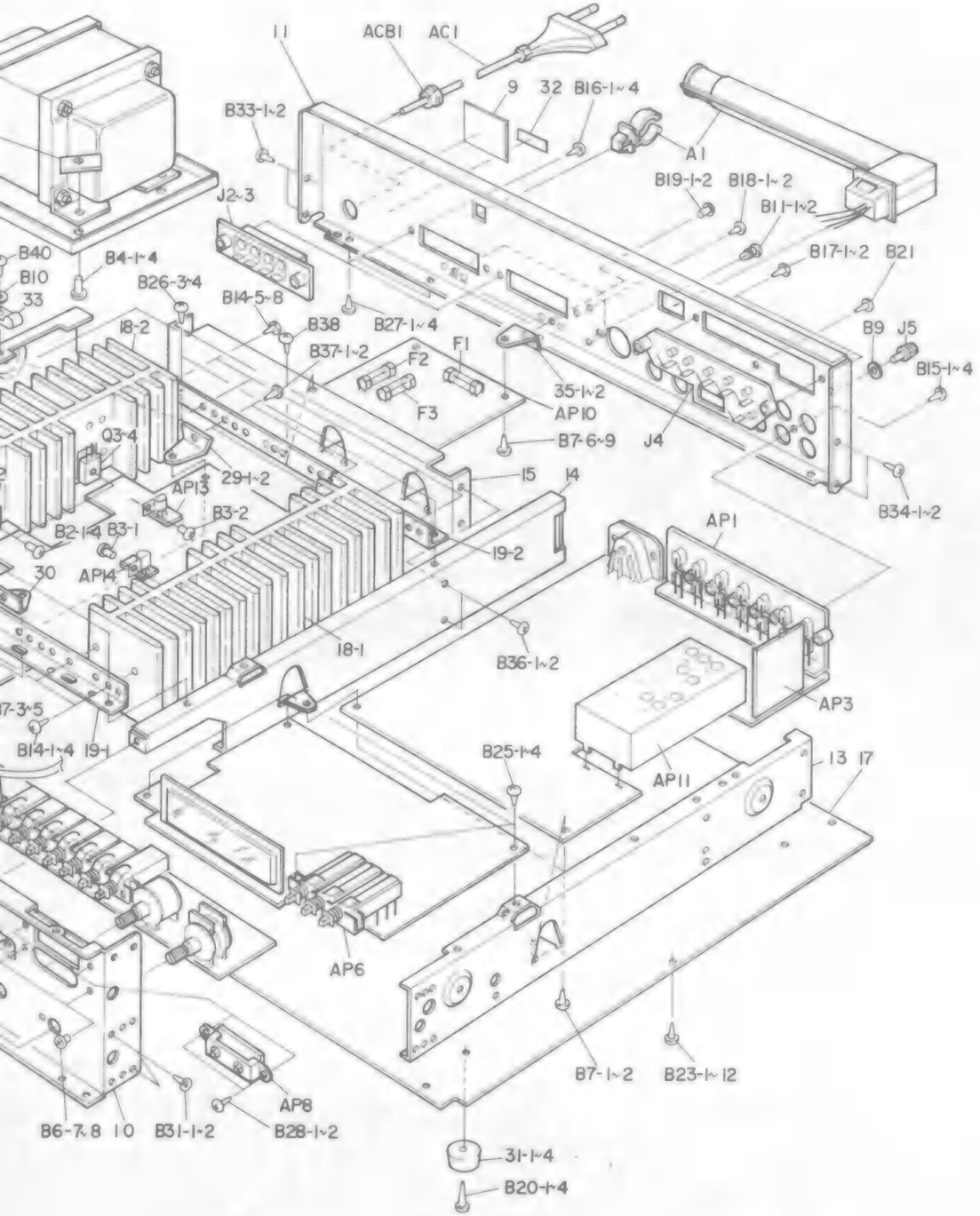
PSTU051COX
YKC142V-1

PSTP015COX
YKC142V-1

PSFA049COX
YKC142V-1

Exploded View





Replacement Parts List

EXPLODED ASSEMBLY	PART NAME: ELEC. ELEMENTS	PART CODE: RA875ASMCL1

No.	REMARKS	PART CODE	PART STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		ACAE03EEA		AC CORD ASSY		ACC1	1
2	EXPLODED	APSMA038D		P.W.BOARD ASSY			1
3	EXPLODED	APSPW051AA		P.W.BOARD ASSY			1
4	EXPLODED	APSSRC8011		P.W.BOARD ASSY			1
5	EXPLODED	APSSRC8021		P.W.BOARD ASSY			1
6	EXPLODED	APSTF003AA		P.W.BOARD ASSY			1
7	EXPLODED	APSZZ051AA		P.W.BOARD ASSY			1
8	EXPLODED	APSZZ052AA		P.W.BOARD ASSY			1
9		CEAG1VALX		ELYT. CAPACITOR	1MFD 35V	C1 C4	2
10		CKDF103PEM		CERAMIC CAP.	0.01MFD 50V -0, +100% E	C1 C2	2
11		DSRC8C4A03		WIRES KIT			1
12		LF151KA01T		K.F.C.		L1	1
13		QTA7768XAT		TRANSISTOR	2SA768 O,Y-RANK	Q6	1
14		QTA1106XAD		TRANSISTOR	2SA1106 O,Y-RANK	Q3 Q4	2
15		QTC1826XAD		TRANSISTOR	2SC1826 O, Y-RANK W/T ACCESSORIES	Q5	1
16		QTC2581XAD		TRANSISTOR	2SC2581 O,Y-RANK	Q1 Q2	2
17		RG2ANJ271B		M-OXIDE FILM R.	2W 270 OHM 5%	R1 R2	2
18		SR0006002N		ROTARY SWITCH		S1	1
19		TEAR120E05		BAR ANTENNA		A1	1
20		TPV95S002Y		PWR.TRANSFORMER		PT1	1
21		TV75D3U1A2		BALANCE COIL		BA1	1

EXPLODED ASSEMBLY	PART NAME: ELEC. ELEMENTS	PART CODE: KA875ASMCL1

No.	REMARKS	PART CODE	PART STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		WM270NB004		BUSHING		ACB1	1
2		YJS03S016Z		PHONE JACK		J1	1
3		YT0015002U		TERMINAL		J5	1
4		YT0050001U		TERMINAL		J4	1
5		YTS04S007U		TERMINAL		J2 J3	2
6		ZFB310201A		FUSE		F1	1
7		ZFB363201A		FUSE		F2 F3	2
8		ZZZ0000154		CORDLESS CONN.		ZZ1 ZZ2	2
9							
10							
11							
12							
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14							
15							
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21							

EXPLODED ASSEMBLY	PART NAME: MECH. ELEMENTS	PART CODE: RAB75ASMCL2									
ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.					QTY USED
1	EXPLODED	AMSRC80E01		ESCUTCHEON ASSY		1					1
2		BRP3055DN8		PAN HEAD RIVET	BRASS	B11-1	B11-2				2
3		BSPB3006WN		WIND HEAD SCREW	+ BIT, M3 X 6 S-NI	B3-1	B3-2				2
4		BSPB3010WN		WIND HEAD SCREW	+ BIT, M3 X 10 S-NI	B2-1	B2-2	B2-3	B2-4		6
5						B41-1	B41-2				
6		BSPB4008NZ		BIND HD SCREW	+ BIT, M4 X 8 S-ZNCR	B4-1	B4-2	B4-3	B4-4		4
7		BSPB5008NN		BIND HD SCREW	+ BIT, M5 X 8 S-NI	B1-1	B1-2	B1-3	B1-4		4
8		BSPC3006NZ		CRMS SCREW	+ BIT, M3 X 6 S-ZNCR	B6-1	B6-2	B6-3	B6-4		8
9						B6-5	B6-6	B6-7	B6-8		
10		BSPP3006N8		PAN HEAD SCREW	+ BIT, M3 X 6 S-BLACK	B19-1	B19-2				2
11		BTPS3006TZ		FLAT TAP SCREW	+ BIT, M3 X 6 S-ZNCR TAP TITE	B5-1	B5-2	B5-3			3
12		BTPW3006BZ		BRAS. TAP SCREW	+ BIT, M3 X 6 S-ZNCR	B26-1	B26-2	B26-3	B26-4		5
13						B39					
14		BTPW3008A8		BRAS TAP SCREW	+ BIT, M3 X 8 S-BLACK	B15-1	B15-2	B15-3	B15-4		10
15						B15-1	B16-2	B16-3	B16-4		
16						B17-1	B17-2				
17		BTPW3008AZ		BRAS. TAP SCREW	+ BIT, M3 X 8 S-ZNCR	B14-1	B14-2	B14-3	B14-4		8
18						B14-5	B14-6	B14-7	B14-8		
19		BTPW3008BB		BRAS. TAP SCREW	+ BIT, M3 X 8 S-BLACK	B18-1	B18-2				2
20		BTPW3008BJ		BRAS. TAP SCREW	+ BIT, S-SN	B22-1	B22-2				2
21		BTPW3008BZ		BRAS. TAP SCREW	+ BIT, M3 X 8 S-ZNCR	B23-1	B23-10	B23-11	B23-12		46

EXPLODED ASSEMBLY	PART NAME: MECH. ELEMENTS	PART CODE: RAB75ASMCL2									
ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.					QTY USED
1						B23-2	B23-3	B23-4	B23-5		
2						B23-6	B23-7	B23-8	B23-9		
3						B24-1	B24-2	B24-3	B24-4		
4						B24-5	B25-1	B25-2	B25-3		
5						B25-4	B27-1	B27-2	B27-3		
6						B27-4	B28-1	B28-2	B29-1		
7						B29-2	B30-1	B30-2	B31-1		
8						B31-2	P32	B33-1	B33-2		
9						B34-1	B34-2	B35-1	B35-2		
10						B35-1	B36-2	B37-1	B37-2		
11						B38	B40				
12		BTPW3010BN		BRAS. TAP SCREW	+ BIT, M3 X 10 S-NI	B21					1
13		BTPW3012BZ		BRAS. TAP SCREW	+ BIT, M3 X 12 S-ZNCR	B20-1	B20-2	B20-3	B20-4		4
14		BTPX3009BZ		I.T.T. SCREW	+ BIT, M3 X 8 S-ZNCR	B7-1	B7-2	B7-3	B7-4		7
15						B7-5	B7-6	B7-7			
16		BWM30A08SN		FLAT L. WASHER	FLAT LARGE, 3 M/M S-NI	B9					1
17		BWM30A08SZ		FLAT L. WASHER	FLAT LARGE, 3 M/M S-ZNCR	B10					1
18		BWM50C09SN		FLAT L. WASHER	FLAT LARGE, 5 M/M S-NI	B8-1	B8-2	B8-3	B8-4		4
19		48772SX001		TRANS BRACKET		20					1
20		48964SX010		REAR PANEL		11					1
21		48962SX001		FRONT PANEL		1					1

EXPLODED ASSEMBLY	PART NAME: MECH. ELEMENTS	PART CODE: RAB75ASMCL2									
ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.					QTY USED
1		ME11XCC002		GAUGE CYL		5					1
2		MH756A0001		HEAT SINK		B18-1	B18-2				2
3		ML221SX033		PCB BRACKET		B6					1
4		ML321SL001		BRACKET PWR		B5-1	B5-2				2
5		ML321SX001		PCB BRACKET		B29-1	B29-2				2
6		ML822SX002		HS BRACKET		B19-1	B19-2				2
7		MN27XA032		KNOB VR		B3-1	B3-2	B3-3	B3-4		4
8		MN28XA056		VR KNOB		2					1
9		MS3175Z004		PLATE		B34-1	B34-2	B34-3	B34-4		4
10		MS996SX005		BOTTOM PLATE		17					1
11		MU581SX001		SIDE BRACKET L		12					1
12		MU581SX003		SIDE BRACKET R		13					1
13		MU581SX004		SIDE BRACKET C		14					1
14		MU581SX005		CENTER BRACKET		15					1
15		MU896SX004		COVER		16					1
16		VM165R2005		BUSHING		B6-1	B6-2				2
17		VM283S8001		KNOB		B1-1	B1-2	B1-3	B1-4		4
18		VN111SP001		BUTTON A		4-1	4-2	4-3	4-4		8
19						4-5	4-6	4-7	4-8		
20		VN121SP007		BUTTON B		5-1	5-2				2
21		VN211SP006		BUTTON A		6-1	6-10	6-11	6-12		12

EXPLODED ASSEMBLY	PART NAME: MECH. ELEMENTS	PART CODE: RAB75ASMCL2									
ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.					QTY USED
1						6-2	6-3	6-4	6-5		
2						6-6	6-7	6-8	6-9		
3		VN211SP007		BUTTON B		7					1
4		VS218RB001		SPONGE		25-1	25-2				2
5		VS229RB001		PAD BOTTOM		21-1	21-2				2
6		VS417NN003		CLAMPER		33					1
7		VS419CW001		LED GUIDE A		27					1
8		VS619RB001		SPONGE		26					1
9		VS627CW001		LED GUIDE B		28					1
10		VS620RB002		BUTTON SHEET B		24					1
11		VS720RB001		BUTTON SHEET A		23					1
12		VVSSRC80E1		SPEAKER PLATE		9					1
13											
14											
15											
16											
17											
18											
19											
20											
21											

EXPLODED ASSEMBLY | PART NAME: ESCUTCHEON ASSY | PART CODE: AMSRC80@01

ITEM NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		AE76[illegible]AA015		ESCUTCHEON		1-A	1
2		VF154SX001		BUTTON GUIDE B		1-C	1/ 2
3		VF172SX001		BUTTON GUIDE		1-E-1 1-E-2	2
4		VF172SX002		BUTTON GUIDE A		1-D	1
5		VS749AK001		PLATE		1-B	1
6							
7		ZAT0015002		ANTENNA			1
8							
9							
10							
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21							

EXPLODED ASSEMBLY | PART NAME: P.W.BOARD ASSY | PART CODE: APSCZ010AD

ITEM NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS				SYMBOLIC OR EXPLODED VIEW NO.				QTY USED
1		CCFB221K0T		CERAMIC CAP.	220PF	50V	-10, +10%	SL	C7				1
2		CCG0220K0T		CERAMIC CAP.	22PF	50V	-10, +10%	SL	C20				1
3		CCG0330K0T		CERAMIC CAP.	33PF	50V	-10, +10%	SL	C18				1
4		CEAB101ALX		ELYT. CAPACITOR	100MFD	6.3V			C26				1
5		CEAD471ALX		ELYT. CAPACITOR	470MFD	16V			C2				1
6		CEVC220ALX		ELYT. CAPACITOR					C16				1
7		CEVC221ALX		ELYT. CAPACITOR					C4				1
8		CEVC470ALX		ELYT. CAPACITOR					C10	C3			2
9		CEVD470ALX		ELYT. CAPACITOR					C5				1
10		CEVGR47ALX		ELYT. CAPACITOR					C1	C12	C9		3
11		CEVG010ALX		ELYT. CAPACITOR					C6				1
12		CKF9103ZFT		CERAMIC CAP.	0.01MFD	50V	-20, +80%	F	C17				1
13		CKFB473ZFT		CERAMIC CAP.	0.047MFD	50V	-20, +80%	F	C11	C13	C14	C15	8
14									C22	C23	C24	C25	
15		CQMB333KTH		MYLAR CAPACITOR	0.033MFD	50V	-10, +10%		C8				1
16		CTZ5300H02		TRIMMER CAP					CT1				1
17		LCADA30384		RF COIL					L1	L2	L3	L4	5
18									L5				
19		MW20195001		TERMINAL									32
20		MW401CX001		SHORT JUMPER	JW-15								1
21		MW401CX003		SHORT JUMPER									11

EXPLODED ASSEMBLY | PART NAME: P.W.BOARD ASSY | PART CODE: APSCZ010AD

ITEM NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		MW401CX005		SHORT JAMPER	JW-15		13
2		MW401CX006		SHOT JAMPER	10MM		31
3		MW401CX008		SHORT JUMPER			1
4		PSCZ010C0X		PRINTED P.W.BOARD			1
5		PSSRC802CX		PRINTED P.W.BOARD			1
6		QDSMA150XN		SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN	D10 D11 D12 D13	13
7						D14 D17 D3 D4	
8						D5 D6 D7 D8	
9						D9	
10		QDZA1075XN		ZENER DIODE	MA1075 VZ 7.0-7.9V NOM. 7.5V	D1	1
11		QDZ5R6EB3A		ZENER DIODE	RD5R6EB3 VZ 5.61-5.91V	D2	1
12		QQMN14008N		I.C.		U1	1
13		QQOMM1203N		I.C.	MM1203 256-BIT C-MOS STATIC RAM	U3	1
14		QQOMN6142N		I.C.	MN6142 16-PIN RADIO PLL SYNTHESIZER	U7	1
15		QQQ04069AA		I.C.	UPD4069C HEX INVERTER	U4	1
16		QTA0564ACN		TRANSISTOR	2SA564A Q,R-RANK	Q12 Q13 Q14 Q15	13
17						Q16 Q18 Q19 Q20	
18						Q21 Q22 Q23 Q24	
19						Q6	
20		QTA0733XDA		TRANSISTOR	2SA733 P,Q-RANK	Q7 Q9 Q9	3
21		QTC0900XCA		TRANSISTOR	2SC900 U-RANK	Q4 Q5	2

EXPLODED ASSEMBLY | PART NAME: P.W.BOARD ASSY | PART CODE: APSCZ010AD

ITEM NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		QTC1685XAN		TRANSISTOR	2SC1685 Q,R-RANK	Q10 Q11 Q17 Q3	4
2		QTL1846XAN		TRANSISTOR	2SC1846 Q,R,S-RANK	Q1	1
3		QTD0325XCC		TRANSISTOR	2SD325 D,E-RANK	Q2	1
4		RD25PJ10JX		CARBON FILM R.	0.25W 10 OHM 5%	R34	1
5		RD25PJ103X		CARBON FILM R.	0.25W 10K OHM 5%	R32	1
6		RD25PJ104X		CARBON FILM R.	0.25W 100K OHM 5%	R25 R26 R27 R28	18
7						R31 R36 R38 R40	
8						R42 R44 R47 R54	
9						R55 R56 R57 R58	
10						R59 R60	
11		RD25PJ154X		CARBON FILM R.	0.25W 150K OHM 5%	R21	1
12		RD25PJ181X		CARBON FILM R.	0.25W 180 OHM 5%	R9	1
13		RD25PJ222X		CARBON FILM R.	0.25W 2.2K OHM 5%	R13	1
14		RD25PJ223X		CARBON FILM R.	0.25W 22K OHM 5%	R46	1
15		RD25PJ272X		CARBON FILM R.	0.25W 2.7K OHM 5%	R10	1
16		RD25PJ333X		CARBON FILM R.	0.25W 33K OHM 5%	R12	1
17		RD25PJ392X		CARBON FILM R.	0.25W 3.9K OHM 5%	R7	1
18		RD25PJ393X		CARBON FILM R.	0.25W 39K OHM 5%	R17 R18 R19 R20	4
19		RD25PJ472X		CARBON FILM R.	0.25W 4.7K OHM 5%	R14 R15 R16 R22	6
20						R23 R24	
21		RD25PJ561X		CARBON FILM R.	0.25W 560 OHM 5%	R4	1

EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSCZ010AD

I/O	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		RD25PJ562X		CARBON FILM R.	0.25W 5.6K OHM 5%	R30 R33 R35 R37	14
2						R39 R41 R43 R45	
3						R48 R49 R50 R51	
4						R52 R53	
5		RD25VJ102X		CARBON FILM R.	0.25W 1K OHM 5%	R6	1
6		RD25VJ103X		CARBON FILM R.	0.25W 10K OHM 5%	R8	1
7		RD25VJ105X		CARBON FILM R.	0.25W 1M OHM 5%	R29	1
8		RD25VJ330X		CARBON FILM R.	0.25W 33 OHM 5%	R5	1
9		RD25VJ561X		CARBON FILM R.	0.25W 560 OHM 5%	R3	1
10		RD25VJ682X		CARBON FILM R.	0.25W 6.8K OHM 5%	R11	1
11		RXHARJ1004		METAL FILM R.	1/2W 1M OHM 5%	R1	1
12		SP03CEX010		PUSH SWITCH		S1	1
13		WUG113EEXX		HI-WRAP WIRE		W01	1
14		WUG215EEXX		HI-WRAP WIRE		W02	1
15		WUG312EEXX		HI-WRAP WIRE		W03	1
16		WUG418EEXX		HI-WRAP WIRE		W04	1
17		WUG518EEXX		HI-WRAP WIRE		W05	1
18		XAZ1040001X		XTAL OSCILLATOR		X1	1
19		YJP08S003Z		JUNCTION JACK	8P-SHF-1AA	Y1	1
20		YJP09S004Z		JUNCTION JACK	9P-SHF-1AA	Y2	1
21		ZLF1P7D8XA		P.L. INDICATOR		LT1	1

EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSLD086AA

I/O	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		PSLD086C0X		PRINTED W.BOARD			1
2		LLBLN317GN		L.E.D.	LN317GP GREEN	LED1	1
3		WYP012CEAA		STRANDED WIRE		W01	1
4		WYP063JEAA		STRANDED WIRE		W02	1
5							
6							
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EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.LOARD ASSY	APSLD087AA

I/O	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		PSLD087C0X		PRINTED W.BOARD			1
2		LLBLN217RN		L.E.D.	LN217RP RED	LED1	1
3		WYP263JEAA		STRANDED WIRE		W01	1
4		WYP911CEAA		STRANDED WIRE		W02	1
5							
6							
7							
8							
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21							

EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSLD088AA

I/O	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		ACCN3466EA		CONN. CORD ASSY		AC1	1
2		ACCN3476EA		CONN. CORD ASSY		AC2	1
3		ACCN3486EA		CONN. CORD ASSY		AC3	1
4		PSLD088C0X		PRINTED W.BOARD			1
5		VD5MA150XN		SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN	D1 D10 D11 D12	15
6						D13 D14 D15 D2	
7						D3 D4 D5 D6	
8						D7 D8 D9	
9		LLBLN217RN		L.E.D.	LN217RP RED	LED14	1
10		LLBLN317GN		L.E.D.	LN317GP GREEN	LED1 LED10 LED11 LED12	13
11						LED13 LED2 LED3 LED4	
12						LED5 LED6 LED7 LED8	
13						LED9	
14		QTC0945AEA		TRANSISTOR	2SC945A P,Q-RANK	Q1 Q2 Q3 Q4	5
15						Q5	
16		RD25PJ472X		CARBON FILM R.	0.25W 4.7K OHM 5%	R2 R3 R4 R5	5
17						R6	
18		RD25PJ562X		CARBON FILM R.	0.25W 5.6K OHM 5%	R1	1
19		SPU1A3X36N		PUSH ON SWITCH.		S1 S2 S3 S4	8
20						S5 S6 S7 S8	
21							

EXPLODED ASSEMBLY	PART NAME: P.W.BOARD ASSY	PART CODE: APSMA038BD

ITEM	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.				Q'TY USED
1		PSA60SL2CX		PRINTED W.BOARD						1
2		PSMA038C0X		PRINTED W.BOARD						1
3		QDSMA150XAM		SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN	D10	D15	D16	D18	11
4						D3	D4	D5	D6	
5						D7	D8	D9		
6		QDSRA12XXB		SILICON DIODE	RA1Z NO-RANK	D11	D12	D13	D14	5
7						D17				
8		QDZRD22ECA		ZENER DIODE	RD22EC VZ 22-24.5 C-RANK	D19				1
9		QTA0564AEN		TRANSISTOR	2SA564A R,S-RANK 50V	Q15				1
10		QTA0720XQN		TRANSISTOR	2SA720 Q,R-RANK	Q10	Q9			2
11		QTA0798XEF		TRANSISTOR	2SA798 F,G-RANK BREAK VOLTAGE 70V	Q1	Q2			2
12		QTA0913XAN		TRANSISTOR	2SA913 Q,R-RANK	Q13	Q14			2
13		QTC1318XQN		TRANSISTOR	2SC1318 Q,R-RANK	Q17	Q7	Q8		3
14		QTC1685XQN		TRANSISTOR	2SC1685 R,S-RANK	Q16				1
15		QTC1885XAN		TRANSISTOR	2SC1885 R,S-RANK	Q3	Q4	Q5	Q6	4
16		QTC1913XAN		TRANSISTOR	2SC1913 Q,R-RANK	Q11	Q12			2
17		RD25PJ101X		CARBON FILM R.	0.25W 100 OHM 5%	R25	R26			2
18		RD25PJ102X		CARBON FILM R.	0.25W 1K OHM 5%	R3	R4			2
19		RD25PJ104X		CARBON FILM R.	0.25W 100K OHM 5%	R56				1
20		RD25PJ124X		CARBON FILM R.	0.25W 120K OHM 5%	R55				1
21		RD25PJ152X		CARBON FILM R.	0.25W 1.5K OHM 5%	R13	R14	R61	R62	4

EXPLODED ASSEMBLY	PART NAME: P.W.BOARD ASSY	PART CODE: APSMA038BD

ITEM	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.				Q'TY USED
1		CCFB221K0T		CERAMIC CAP.	220PF 50V -10, +10% SL	C3	C4			2
2		CCGB020C0T		CERAMIC CAP.	SL 2PF 50V -0.25, +0.25PF	C13	C14			2
3		CCGB101K0T		CERAMIC CAP.	100PF 50V -10, +10% SL	C5	C6			2
4		CCGB180K0T		CERAMIC CAP.	18PF 50V -10, +10% SL	C15	C16	C21	C22	4
5		CCGB680K0T		CERAMIC CAP.	68PF 50V -10, +10% SL	C31	C32	C33	C34	4
6		CEAC101ALX		ELYT. CAPACITOR	100MFD 10V	C42	C43			2
7		CEAE470ALX		ELYT. CAPACITOR	47MFD 25V	C46				1
8		CEAG220ALX		ELYT. CAPACITOR	22MFD 50V	C44				1
9		CEAG470ALX		ELYT. CAPACITOR	47MFD 50V	C19	C20			2
10		CEVC470ALX		ELYT. CAPACITOR		C11	C12			2
11		CEVE4R7ALX		ELYT. CAPACITOR		C25	C26	C27	C28	4
12		CEVG010ALX		ELYT. CAPACITOR		C1	C17	C18	C2	8
13						C51	C52	C53	C54	
14		CEVS100ALX		ELYT. CAPACITOR		C7	C8			2
15		CKFB223ZFT		CERAMIC CAP.	0.022MFD 50V -20, +80% F	C23	C24	C29	C30	4
16		CKFB473ZFT		CERAMIC CAP.	0.047MFD 50V -20, +80% F	C45				1
17		CQMC563KEH		MYLAR CAPACITOR		C35	C36			2
18		LA3LE1024A		CHOKE COIL		L1	L2			2
19		MW2T1PS001		TERMINAL						4
20		MW2D1BS003		TERMINAL						4
21		MW401CX005		SHOT JAMPER	10MM					16

EXPLODED ASSEMBLY	PART NAME: P.W.BOARD ASSY	PART CODE: APSMA038BD

ITEM	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.				Q'TY USED
1		RD25PJ222X		CARBON FILM R.	0.25W 2.2K OHM 5%	R10	R7	R8	R9	4
2		RD25PJ223X		CARBON FILM R.	0.25W 22K OHM 5%	R11	R12	R50	R51	4
3		RD25PJ332X		CARBON FILM R.	0.25W 3.3K OHM 5%	R27	R28	R52	R53	4
4		RD25PJ333X		CARBON FILM R.	0.25W 33K OHM 5%	R17	R18			2
5		RD25PJ391X		CARBON FILM R.	0.25W 390 OHM 5%	R63	R64			2
6		RD25PJ394X		CARBON FILM R.	0.25W 390K OHM 5%	R54				1
7		RD25PJ683X		CARBON FILM R.	0.25W 68K OHM 5%	R1	R2			2
8		RD25TJ331X		CARBON FILM R.	0.25W 330 OHM 5%	R29	R30	R31	R32	4
9		RD25TJ470X		CARBON FILM R.	0.25W 47 OHM 5%	R19	R20			2
10		RD25TJ5R6X		CARBON FILM R.	0.25W 5.6 OHM 5%	R5	R6			2
11		RF05UKR47B		WIRE WOUND R	5W 0.47 OHM 10%	R37	R38	R39	R40	4
12		RGHANJ332B		M-OXIDE FILM R.	1/2W 3.3K OHM 5%	R21	R22			2
13		RGHANJ472B		M-OXIDE FILM R.	1/2W 4.7K OHM 5%	R23	R24			2
14		RGHARJ101B		M-OXIDE FILM R.	1/2W 100 OHM 5%	R59				1
15		RGHARJ151B		M-OXIDE FILM R.	1/2W 150 OHM 5%	R33	R34	R35	R36	4
16		RG1ARJ222B		M-OXIDE FILM R.	1W 2.2K OHM 5%	R60				1
17		RG1ARJ332B		M-OXIDE FILM R.	1W 3.3K OHM 5%	R58				1
18		RG1ARJ562B		M-OXIDE FILM R.	1W 5.6K OHM 5%	R15	R16			2
19		RG2ARJ561B		M-OXIDE FILM R.	2W 560 OHM 5%	R57				1
20		RPJN633132		SEMI-FIXED VR.	330 OHM B-CURVE	RV1	RV2			2
21		RXHARJ100Y		M-OXIDE FILM R.	1/2W 10 OHM 5%	R43	R44			2

EXPLODED ASSEMBLY	PART NAME: P.W.BOARD ASSY	PART CODE: APSMA038BD

ITEM	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.				Q'TY USED
1		RX2ARJ5R6B		M-OXIDE FILM R.	2W 5.6 OHM 5%	R41	R42			2
2		WTGP06EEXX		SOLID WIRE		J3				1
3		WUG415EEXX		HI-WRAP WIRE		N01	N04			2
4		WUG515EEXX		HI-WRAP.WIRE		N02	N05			2
5		WUG615EEXX		HI-WRAP WIRE		N03	N06			2
6		YZA1500001		U. TERMINAL		Y1	Y2	Y3		3
7		YZA2000001		U. TERMINAL		Y4				1
8		ZRA2441022		RELAY		K1				1
9										
10										
11										
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EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSPA049A0

ITEM NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		CCFB151K0T		CERAMIC CAP.	150PF 50V -10, +10% SL	C13 C14 C15 C16	4
2		CEA470NLX		ELYT. CAPACITOR		C1 C17 C18 C2	4
3		CEVB221ALX		ELYT. CAPACITOR		C10 C11 C12 C9	4
4		CEV0101ALX		ELYT. CAPACITOR		C5 C6 C7 C8	4
5		CQMB472KTH		MYLAR CAPACITOR	4700PF 50V -10, +10%	C3 C4	2
6		PSPA049C0X		PRINTED W.BOARD			1
7		JDZ5R1EB3A		ZENER DIODE	KD5.1EB3 VZ 5.09-5.37V	D1 D2 D3 D4	4
8		QTA0722XBN		TRANSISTOR	2SA722 S-RANK	Q5 Q6	2
9		QTA1092XAN		TRANSISTOR	2SA1092 S,T-RANK	Q3 Q4	2
10		QTC1318XGN		TRANSISTOR	2SC1318 R,S-RANK	Q7 Q8	2
11		QTC2557XAN		TRANSISTOR	2SC2557 S,T-RANK	Q1 Q2	2
12		RD25PJ152X		CARBON FILM R.	0.25W 1.5K OHM 5%	R13 R14 R27 R28	6
13						R7 R8	
14		RD25PJ271X		CARBON FILM R.	0.25W 270 OHM 5%	R29 R30	2
15		RD25PJ332X		CARBON FILM R.	0.25W 3.3K OHM 5%	R5 R6	2
16		RD25PJ362X		CARBON FILM R.	0.25W 3.6K OHM 5%	R10 R11 R12 R15	8
17						R16 R17 R18 R9	
18		RD25PJ470X		CARBON FILM R.	0.25W 47 OHM 5%	R1 R2	2
19		RD25PJ560X		CARBON FILM R.	0.25W 56 OHM 5%	R19 R20 R21 R22	4
20		RD25PJ8R2X		CARBON FILM R.	0.25W 8.2 OHM 5%	R3 R4	2
21		RGHAKJ391B		M-OXIDE FILM R.	1/2W 390 OHM 5%	R23 R24 R25 R26	4

EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSPA049A0

ITEM NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		WUG110EEXX		HI-WRAP WIRE		NO1	1
2		WUG209EEXX		HI-WRAP WIRE		NO2	1
3		WUG310EEXX		HI-WRAP WIRE		NO3	1
4		WUG409EEXX		HI-WRAP WIRE		NO4	1
5		WUG509EEXX		HI-WRAP WIRE		NO5	1
6		YZA1500002		3P L TERMINAL		Y1	1
7		YZA2500002		5P L TERMINAL		Y2	1
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EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSPT015A0

ITEM NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		CCFB151K0T		CERAMIC CAP.	150PF 50V -10, +10% SL	C7 C8	2
2		CCFB271K0T		CERAMIC CAP.	270PF 50V -10, +10% SL	C1 C2	2
3		CCGB470K0T		CERAMIC CAP.	47PF 50V -10, +10% SL	C13 C14	2
4		CEAG0R1ZMN		ELYT. CAPACITOR	0.1MFD 50V MS	C23 C24	2
5		CEVF100ALX		ELYT. CAPACITOR		C5 C6	2
6		CEVF470ALX		ELYT. CAPACITOR		C11 C12 C15 C16	4
7		CEVG010ALX		ELYT. CAPACITOR		C10 C9	2
8		CQMB182KTH		MYLAR CAPACITOR	1800PF 50V -10, +10%	C21 C22	2
9		CQMB393KTH		MYLAR CAPACITOR	0.039MFD 50V -10, +10%	C17 C18 C19 C20	4
10		CQMB682KTH		MYLAR CAPACITOR	6800PF 50V -10, +10%	C25 C26	2
11		CQV31P4JCN		MYLAR FILM CAP.		C3 C4	2
12		MW2018S001		TERMINAL			3
13		MW4D1CX005		SHORT JAMPER	JW-15		1
14		MW4C1CX006		SHORT JAMPER	10MM		12
15		PSPTU15C0X		PRINTED W.BOARD			1
16		QQM36551AN		I.C.	AN6551 NS-SELECT.	U1 U2	2
17		RD25PJ102X		CARBON FILM R.	0.25W 1K OHM 5%	R11 R12	2
18		RD25PJ103X		CARBON FILM R.	0.25W 10K OHM 5%	R37 R38	2
19		RD25PJ104X		CARBON FILM R.	0.25W 100K OHM 5%	R21 R22 R27 R28	4
20		RD25PJ105X		CARBON FILM R.	0.25W 1M OHM 5%	R10 R31 R32 R49	6
21						R50 R9	

EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSPT015A0

ITEM NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		RD25PJ123X		CARBON FILM R.	0.25W 12K OHM 5%	R33 R34 R35 R36	4
2		RD25PJ124X		CARBON FILM R.	0.25W 120K OHM 5%	R7 R8	2
3		RD25PJ152X		CARBON FILM R.	0.25W 1.5K OHM 5%	R43 R44	2
4		RD25PJ154X		CARBON FILM R.	0.25W 150K OHM 5%	R25 R26	2
5		RD25PJ183X		CARBON FILM R.	0.25W 18K OHM 5%	R45 R46 R5 R6	4
6		RD25PJ222X		CARBON FILM R.	0.25W 2.2K OHM 5%	R3 R39 R4 R40	6
7						R41 R42	
8		RD25PJ332X		CARBON FILM R.	0.25W 3.3K OHM 5%	R29 R30	2
9		RD25PJ471X		CARBON FILM R.	0.25W 470 OHM 5%	R23 R24	2
10		RD25PJ472X		CARBON FILM R.	0.25W 4.7K OHM 5%	R19 R20	2
11		RD25PJ562X		CARBON FILM R.	0.25W 5.6K OHM 5%	R17 R18	2
12		RD25PJ681X		CARBON FILM R.	0.25W 680 OHM 5%	R13 R14	2
13		RD25PJ751X		CARBON FILM R.	0.25W 750 OHM 5%	R15 R16	2
14		RD25PJ822X		CARBON FILM R.	0.25W 8.2K OHM 5%	R47 R48	2
15		RVQA104B04		VR	100K OHM B-CURVE 16M/M 2-GANGS	VR2	1
16		RVJA254X02		VR.	250K OHM 16M/M 2-GANGS	VR1	1
17		RVJA503B10		VR.	50K OHM B-CURVE 16M/M 2-GANGS	VR3 VR4	2
18		SP02CAX00D		PUSH SWITCH		S1	1
19		SP07CFX02A		PUSH SWITCH		S2	1
20		WP0935003T		PC-JOINT		JU1	1
21		WP1335008T		PC-JOINT		JU2	1

EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSPT015AD

NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		WUG313E8XX		MI-WRAP WIRE	6		1
2		WUG411E8XX		MI-WRAP WIRE	5		1
3		WUG620E8XX		MI-WRAP WIRE	N06		1
4		WUG723E8XX		MI-WRAP WIRE	N07		1
5		WWF119JJJJ		SHIELDED WIRE	N01		1
6		WWF218JJJJ		SHIELDED WIRE	N02		1
7		WWF326JJJJ		SHIELDED WIRE	N03		1
8		YZA1500001		U. TERMINAL	Y4 Y5 Y6		3
9		YZA2000001		U. TERMINAL	Y7		1
10							
11							
12							
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EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSPW051AA

NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		BTPW430J8AZ		BRAS. TAP SCREW	+ BIT, M3 X 8 S-ZnCR	B1	1
2		CEA010J4LX		ELYT. CAPACITOR	10MFD 16V	C2	1
3		CEA047LALX		ELYT. CAPACITOR	470MFD 16V	C3	1
4		CEAE101ALX		ELYT. CAPACITOR	100MFD 25V	C4	1
5		CEAF102ALX		ELYT. CAPACITOR	1000MFD 25V	C5	1
6		CEAS4R7ALX		ELYT. CAPACITOR	4.7MFD 25V	C6	1
7		CFQ1V822J1		ELYT. CAPACITOR		C7 C8	2
8		CKD9473ZFM		CERAMIC CAP.	0.047MFD 50V -20, +20% F	C1	1
9		CKDE103PFM		CERAMIC CAP.	0.01MFD 500V -0, +100% E	C10 C11 C9	3
10		HD242AD001		HEAT SINK		HS1	1
11		HW201BS001		TERMINAL			30
12		PSPWB51CJX		PRINTED WIRING BOARD			1
13		QDSEM1ZXXD		SILICON DIODE	EMIZ SANKEN	D4	1
14		QDSMA150AN		SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN	D10	1
15		QDSR3AM60E		SILICON DIODE	SR3AM-6RVRRM400VR 320VRSM500VFM 1.1	D6 D7 D8 D9	4
16		QDS51RBAAK		SILICON DIODE	S1RBA	D5	1
17		QDZ150E33A		ZENER DIODE	RD15EM3 VZ 14.35-15.69V	D3	1
18		QDZ240E84A		ZENER DIODE	RD24EM4 VZ 23.63-24.85V	D2	1
19		QDZ3R9EM2A		ZENER DIODE	RD3.9EB2 VZ 3.89-4.16V	D1	1
20		QTA0768XBD		TRANSISTOR	2SA768 D,Y-RANK	Q2	1
21		QTC1626XBD		TRANSISTOR	2SC1626 D, Y-RANK NO ACCESSORIES	Q1	1

EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSPW051AA

NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		RD25TJ101X		CARBON FILM R.	0.25W 100 OHM 5%	R3	1
2		RD25TJ102X		CARBON FILM R.	0.25W 1K OHM 5%	R4	1
3		RD25TJ103X		CARBON FILM R.	0.25W 10K OHM 5%	R8	1
4		RD25TJ222X		CARBON FILM R.	0.25W 2.2K OHM 5%	R5	1
5		RD25TJ681X		CARBON FILM R.	0.25W 680 OHM 5%	R2	1
6		RGMAKJ122B		M-OXIDE FILM R.	1/2W 1.2K OHM 5%	R7	1
7		RG1ANJ103B		M-OXIDE FILM R.	1W 10K OHM 5%	R10	1
8		RG1ARJ272B		M-OXIDE FILM R.	1W 2.7K OHM 5%	R9	1
9		RG1ARJ391B		M-OXIDE FILM R.	1W 390 OHM 5%	R6	1
10		RX1ARJ5R6W		M-OXIDE FILM R.		R1	1
11		THS2430B2W		HEATER TRANS.		T1	1
12		YHF3P0J0LZ		FUSE HOLDER		FH1 FH2 FH3 FH4	6
13						FH5 FH6	
14							
15							
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EXPLODED ASSEMBLY	PART NAME	PART CODE
	P.W.BOARD ASSY	APSRG3011

NO.	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1	EXPLODED	APSLJ096AA		P.W.BOARD ASSY			1
2	EXPLODED	APSLJ087AA		P.W.BOARD ASSY			1
3	EXPLODED	APSPL047AD		P.W.BOARD ASSY			1
4	EXPLODED	APSPT015AD		P.W.BOARD ASSY			1
5	EXPLODED	APSTU051AD		P.W.BOARD ASSY			1
6							
7							
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EXPLODED ASSEMBLY | PART NAME: P.W.BOARD ASSY | PART CODE: APSSRC8021

ITEM	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1	EXPLODED	APSCZ010AD		P.W.BOARD ASSY			1
2	EXPLODED	APSLD088AA		P.W.BOARD ASSY			1
3	EXPLODED	APSSW154AA		P.W.BOARD ASSY			1
4	EXPLODED	APSSW158AA		P.W.BOARD ASSY			1
5							
6							
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EXPLODED ASSEMBLY | PART NAME: P.W.BOARD ASSY | PART CODE: APSSW154AA

ITEM	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		MB621S0001		SW BRACKET		BK1	1
2		PSSW154C0X		PRINTED W.BOARD			1
3		DS4148DAN		SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN	D1 D2	2
4		SP01A9X36N		PUSH ON SWITCH.		S1 S2	2
5							
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EXPLODED ASSEMBLY | PART NAME: P.W.BOARD ASSY | PART CODE: APSSW158AA

ITEM	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		CKFB1037FT		CERAMIC CAP.	0.01MFD 50V -20, +80% F	C1 C2	2
2		MW2018300J		TERMINAL			1
3		PSSW158C0X		PRINTED W.BOARD			1
4		SP01AA309A		PUSH SWITCH		S1	1
5							
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EXPLODED ASSEMBLY | PART NAME: P.W.BOARD ASSY | PART CODE: APSTF003AA

ITEM	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		CCD030D0M		CERAMIC CAP.	SL 3PF 50V -0.5, +0.5PF	C36	1
2		CCD040D0M		CERAMIC CAP.	SL 4PF 50V -0.5, +0.5PF	C24	1
3		CCD050D0M		CERAMIC CAP.	SL 5PF 50V -0.5, +0.5PF	C12	1
4		CCD070D0M		CERAMIC CAP.	SL 7PF 50V -0.5, +0.5PF	C1 C10	2
5		CCD100D0M		CERAMIC CAP.	CH 10PF 50V -0.5, +0.5PF	C20 C22	2
6		CCD100D0M		CERAMIC CAP.	CH 10PF 50V -0.5, +0.5PF	C21	1
7		CCD100D0M		CERAMIC CAP.	SL 10PF 50V -0.5, +0.5PF	C25	1
8		CCD101K0M		CERAMIC CAP.	100PF 50V -10, +10% SL	C14	1
9		CCD330K0M		CERAMIC CAP.	33PF 50V -10, +10% CH	C19	1
10		CCD471K0M		CERAMIC CAP.	470PF 50V -10, +10% SL	C26	1
11		CCD822K0M		CERAMIC CAP.	8200PF 50V -10, +10% SL	C30	1
12		CEA047GALX		ELEC. CAPACITOR	47MFD 16V	C34	1
13		CG2HR51KPR		MYLAR CAPACITOR		C13	1
14		CKD1022ZFM		CERAMIC CAP.	1000PF 50V -20, +80% F	C3 C5 C8	3
15		CKD103ZFM		CERAMIC CAP.	0.01MFD 50V -20, +80% F	C11 C16 C2 C23	9
16						C29 C32 C35 C4	
17						C7	
18		CKD152K0M		CERAMIC CAP.		C33	1
19		CKD223ZFM		CERAMIC CAP.	0.022MFD 50V -20, +20% F	C15 C17 C18 C27	7
20						C37 C38 C9	
21		CKD472ZFM		CERAMIC CAP.	4700PF 50V -20, +80% F	C31 C6	2

EXPLODED ASSEMBLY	PART NAME	PART CODE	
	P.W.BOARD ASSY	APSTF003AA	

Item	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		CTZ610GM01		TRIMMER CAP.		CT1 CT2 CT3	3
2		LCA0A3616A		RF COIL		L1	1
3		LF180JC01K		RF COIL.		L2	1
4		M8761SA001		SHIELD COVER		SL2	1
5		M8763SX002		SHIELD.CASE		SL1	1
6		MS535SX004		PLATE		SL3 SL4 SL5	3
7		MT221CS001		TERMINAL			4
8		MWZ1310003		TERMINAL			4
9		MWZ1CX0001		SHORT JUMPER	JW-1D		4
10		PSTF003CAX		PRINTED W.BOARD			1
11		QDCTT310AQ		VARI-CAP DIODE	1TT310AQ 12V A-RANK 3PCS-SAME-RANK	D1 D2 D3	3
12		QDSMA150N		SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN	D4	1
13		QDZA1047XN		ZENER DIODE	MA1047 VZ 4.4-5.0V NOM. 4.7V	D5	1
14		QQMAN6821N		I.C.	AN6821 9-PIN 1/20 DIVDER	U1	1
15		QTC0945AQA		TRANSISTOR	2SC945A P,Q-RANK	Q6	1
16		QTC1674XAA		TRANSISTOR	2SC1674 L-RANK	Q2 Q3	2
17		QTC1674XBA		TRANSISTOR		Q4	1
18		QTC1675XBA		TRANSISTOR	2SC1675 K,L-RANK	Q5	1
19		QTD0636XBN		TRANSISTOR	2SD636 Q,R-RANK	Q7	1
20		QTL0349XBN		TRANSISTOR	3SK49 Q-RANK	D1	1
21		RD25PJ101X		CARBON FILM R.	0.25W 100 OHM 5%	R14 R15 R22 R26	6

EXPLODED ASSEMBLY	PART NAME	PART CODE	
	P.W.BOARD ASSY	APSTF003AA	

Item	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1						R5 R7	
2		RD25PJ102X		CARBON FILM R.	0.25W 1K OHM 5%	R13	1
3		RD25PJ103X		CARBON FILM R.	0.25W 10K OHM 5%	R18 R8	2
4		RD25PJ104X		CARBON FILM R.	0.25W 100K OHM 5%	R1 R10 R19	3
5		RD25PJ124X		CARBON FILM R.	0.25W 120K OHM 5%	R2	1
6		RD25PJ151X		CARBON FILM R.	0.25W 150 OHM 5%	R25	1
7		RD25PJ223X		CARBON FILM R.	0.25W 22K OHM 5%	R12	1
8		RD25PJ332X		CARBON FILM R.	0.25W 3.3K OHM 5%	R27	1
9		RD25PJ470X		CARBON FILM R.	0.25W 47 OHM 5%	R9	1
10		RD25PJ471X		CARBON FILM R.	0.25W 470 OHM 5%	R21	1
11		RD25PJ472X		CARBON FILM R.	0.25W 4.7K OHM 5%	R11	1
12		RD25PJ473X		CARBON FILM R.	0.25W 47K OHM 5%	R23	1
13		RD25PJ562X		CARBON FILM R.	0.25W 5.6K OHM 5%	R28	1
14		RD25PJ564X		CARBON FILM R.	0.25W 560K OHM 5%	R4	1
15		RD25TJ393X		CARBON FILM R.	0.25W 39K OHM 5%	R29	1
16		RD25VJ123X		CARBON FILM R.	0.25W 12K OHM 5%	R16	1
17		RD25VJ152X		CARBON FILM R.	0.25W 1.5K OHM 5%	R17	1
18		RD25VJ220X		CARBON FILM R.	0.25W 22 OHM 5%	R6	1
19		RD25VJ334X		CARBON FILM R.	0.25W 330K OHM 5%	R3	1
20		RD25VJ473X		CARBON FILM R.	0.25W 47K OHM 5%	R24	1
21		RD25VJ563X		CARBON FILM R.	0.25W 56K OHM 5%	R20	1

EXPLODED ASSEMBLY	PART NAME	PART CODE	
	P.W.BOARD ASSY	APSTU051AD	

Item	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		ACCW221ULA		CTRN BORD ASSY		AC1 AC2	2
2		ACCN3456EA		CONN. BORD ASSY		AC3	1
3		CCCH330KQM		CERAMIC CAP.	33PF 50V -10, +10% SL	C37	1
4		CCCH470KQT		CERAMIC CAP.	47PF 50V -10, +10% SL	C4	1
5		CCCF151KQT		CERAMIC CAP.	150PF 50V -10, +10% SL	C15	1
6		CCCF221KQT		CERAMIC CAP.	220PF 50V -10, +10% SL	C103 C104	2
7		CCCH101KQT		CERAMIC CAP.	100PF 50V -10, +10% SL	C68 C87	2
8		CCCH220KQT		CERAMIC CAP.	22PF 50V -10, +10% SL	C50	1
9		CCCH560KQT		CERAMIC CAP.	56PF 50V -10, +10% SL	C17	1
10		CEAD221ALX		ELYT. CAPACITOR	220MFD 16V	C30 C64 C93	3
11		CEAD471ALX		ELYT. CAPACITOR	470MFD 16V	C96 C94 C95	3
12		CEAGR22ZMN		ELYT. CAPACITOR	0.22MFD 50V M5	C53	1
13		CEAS010ZMN		ELYT. CAPACITOR	1MFD 50V M5	C101 C102	2
14		CEVC470ALX		ELYT. CAPACITOR		C105 C106	2
15		CEV0100ALX		ELYT. CAPACITOR		C20 C21 C56 C65	5
16						C66	
17		CEV047UALX		ELYT. CAPACITOR		C13	1
18		CEVEL0UALX		ELYT. CAPACITOR		C71 C72	2
19		CEVS4R7ALX		ELYT. CAPACITOR		C144 C25 C38 C55	6
20						C85 C86	
21		CEVG100ALX		ELYT. CAPACITOR		C107 C108 C40 C45	10

EXPLODED ASSEMBLY	PART NAME	PART CODE	
	P.W.BOARD ASSY	APSTF003AA	

Item	REMARKS	PART CODE	PART. STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		TRA7JZ0025		RF COIL		T2	1
2		TRA7JZ0075		RF COIL		T1	1
3		TR13MA0025		I.F.T.		T3	1
4		TR13M00054		RF COIL		T4	1
5		W0G210EFAX		MI-WRAP WIRE		NO1	1
6							
7							
8							
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EXPLODED ASSEMBLY	PART NAME	PART CODE	
	P.W.BOARD ASSY	APSTU051AD	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.				QTY USED
1						C57	C58	C62	C83	
2						C84	C88			
3		CEVG2R2ALX		ELYT. CAPACITOR		C47	C91	C92		3
4		CEVG3R3ALX		ELYT. CAPACITOR		C61				1
5		CKD8103ZFT		CERAMIC CAP.	0.01MFD 50V -20, +80% F	C14	C24	C26	C52	7
6						C6	C7	C8		
7		CKD8223ZFM		CERAMIC CAP.	0.022MFD 50V -20, +20% F	C1	C10	C19	C22	10
8						C3	C31	C32	C34	
9						C35	C36			
10		CKD8223ZFT		CERAMIC CAP.	0.022MFD 50V -20, +20% F	C13	C48	C49	C51	5
11						C53				
12		CKD8473ZFM		CERAMIC CAP.	0.047MFD 50V -20, +20% F	C96				1
13		CKD8473ZFT		CERAMIC CAP.	0.047MFD 50V -20, +80% F	C59	C89			2
14		CKF8473ZFT		CERAMIC CAP.	0.047MFD 50V -20, +80% F	C16	C39	C41	C42	8
15						C43	C44	C5	C9	
16		CKG8561KBT		CERAMIC CAP.	560PF 50V -10, +10% B	C81	C82			2
17		CQM8102KEH		MYLAR CAPACITOR	1000PF 50V -10, +10%	C73	C74			2
18		CQM8103KEH		MYLAR CAPACITOR	0.01MFD 50V -10, +10%	C23				1
19		CQM8122JEH		MYLAR CAPACITOR	1200PF 50V -5, +5%	C109	C110	C69	C70	4
20		CQM8222KEH		MYLAR CAPACITOR	2200PF 50V -10, +10%	C77	C78			2
21		CQM8332KEH		MYLAR CAPACITOR	3300PF 50V -10, +10%	C113				1

EXPLODED ASSEMBLY	PART NAME	PART CODE	
	P.W.BOARD ASSY	APSTU051AD	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.				QTY USED
1		CQM8392JEH		MYLAR CAPACITOR	3900PF 50V -5, +5%	C111	C112			2
2		CQM8683KEH		MYLAR CAPACITOR	0.068MFD 50V -10, +10%	C54				1
3		CQSC182JCF		STYROFLEX CAP.	1800PF 100V -5, +5%	C79	C80			2
4		CQSC251JCF		STYROFLEX CAP.		C75	C76			2
5		CQSC471JCF		STYROFLEX CAP.	470PF 100V -5, +5%	C12	C60			2
6		CTZ6200H01		TRIMMER CAP.		CT1	CT2			2
7		FBR450A01M		CERAMIC FILTOR		FL1	FL4			2
8		FB10R7F17M		CERAMIC FILTER		FL2	FL3			2
9		LCADA303BA		RF COIL		L2	L3			2
10		LF393JC01K		CHOKE COIL		L6	L7			2
11		LF683JC01K		CHOKE COIL		L4	L5			2
12		MB644SX001		SHIELD		SL1				1
13		MW2018S001		TERMINAL						29
14		MW401CX002		SHORT JUMPER						11
15		MW401CX005		SHORT JAMPER	JW-15					3
16		MW401CX006		SHOT JAMPER	10MM					27
17		PSSRC801CX		PRINTED W.BOARD						1
18		PSTU051C0X		PRINTED W.BOARD						1
19		QDCBB509CQ		VRRICAP.DIODE	BB509 CORD 2PCS-SAME-RANK	D1	D2			2
20		QDG1N60XXT		GERMANIUM DIODE	1N60 NO-RANK	D23	D24			2
21		QDSMA150XN		SILICON DIODE	MA150 VF 1.2V,VR 35V NO-RANK 24MIN	D10	D11	D12	D13	19

EXPLODED ASSEMBLY	PART NAME	PART CODE	
	P.W.BOARD ASSY	APSTU051AD	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.				QTY USED
1						D14	D15	D16	D17	
2						D18	D20	D21	D22	
3						D3	D4	D5	D6	
4						D7	D8	D9		
5		QDZ9K1EB3A		ZENER DIODE	RD9.1EB3 VZ 8.83-9.30V	D19				1
6		QQMA1231NC		I.C.	LA1231N	U2				1
7		QQM01161AA		I.C.	UPC1161C	U4				1
8		QQM01178AA		I.C.	UPC1178C	U1				1
9		QQM04559AJ		I.C.	NJM4559D-A NOSELECTOPERATIONAL AMP.	U5				1
10		QQU04049AA		I.C.	UPD4049	U3				1
11		QTA0564ACN		TRANSISTOR	2SA564A Q,R-RANK	Q11	Q17	Q23	Q24	6
12						Q29	Q8			
13		QTC1675XBA		TRANSISTOR	2SC1675 K,L-RANK	Q3	Q4	Q5		3
14		QTC1685XAN		TRANSISTOR	2SC1685 Q,R-RANK	Q1	Q10	Q12	Q13	14
15						Q14	Q15	Q16	Q18	
16						Q2	Q21	Q22	Q27	
17						Q7	Q9			
18		QTC1845XAA		TRANSISTOR	2SC1845 E,F-RANK	Q19	Q20			2
19		QTD0325XCC		TRANSISTOR	2SD325 D,E-KANK	Q25				1
20		QTK0058XBA		TRANSISTOR	2SK68 L,M-RANK	Q6				1
21		RD25PJ100X		CARBON FILM R.	0.25W 10 OHM 5%	R22				1

EXPLODED ASSEMBLY	PART NAME	PART CODE	
	P.W.BOARD ASSY	APSTU051AD	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.				QTY USED
1		RD25PJ101X		CARBON FILM R.	0.25W 100 OHM 5%	R25	R28	R33		3
2		RD25PJ102X		CARBON FILM R.	0.25W 1K OHM 5%	R153	R154	R161	R162	6
3						R29	R85			
4		RD25PJ103X		CARBON FILM R.	0.25W 10K OHM 5%	R128	R2	R32	R37	13
5						R48	R5	R63	R75	
6						R77	R79	R8	R81	
7						R9				
8		RD25PJ104X		CARBON FILM R.	0.25W 100K OHM 5%	R115	R116	R141	R142	12
9						R149	R150	R151	R152	
10						R36	R6	R61	R68	
11		RD25PJ105X		CARBON FILM R.	0.25W 1M OHM 5%	R165	R41			2
12		RD25PJ122X		CARBON FILM R.	0.25W 1.2K OHM 5%	R51				1
13		RD25PJ123X		CARBON FILM R.	0.25W 12K OHM 5%	R12	R132	R133	R97	5
14						R98				
15		RD25PJ132X		CARBON FILM R.	0.25W 1.3K OHM 5%	R155	R156			2
16		RD25PJ152X		CARBON FILM R.	0.25W 1.5K OHM 5%	R21				1
17		RD25PJ153X		CARBON FILM R.	0.25W 15K OHM 5%	R124	R126	R31	R84	6
18						R93	R94			
19		RD25PJ154X		CARBON FILM R.	0.25W 150K OHM 5%	R3	R73			2
20		RD25PJ182X		CARBON FILM R.	0.25W 1.8K OHM 5%	R125	R78			2
21		RD25PJ183X		CARBON FILM R.	0.25W 18K OHM 5%	R64	R88			2

EXPLODED ASSEMBLY	PART NAME: P.W.BOARD ASSY	PART CODE: APSTU051AD	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.				QTY USED
1		RD25PJ184X		CARBON FILM R.	0.25W 180K OHM 5%	R70				1
2		RD25PJ221X		CARBON FILM R.	0.25W 220 OHM 5%	R4				1
3		RD25PJ222X		CARBON FILM R.	0.25W 2.2K OHM 5%	R10	R145	R146	R147	8
4						R148	R35	R39	R7	
5		RD25PJ223X		CARBON FILM R.	0.25W 22K OHM 5%	R105	R38	R43	R76	6
6						R91	R92			
7		RD25PJ224X		CARBON FILM R.	0.25W 220K OHM 5%	R163	R164	R52	R53	4
8		RD25PJ225X		CARBON FILM R.	0.25W 2.2M OHM 5%	R65				1
9		RD25PJ272X		CARBON FILM R.	0.25W 2.7K OHM 5%	R111	R112			2
10		RD25PJ273X		CARBON FILM R.	0.25W 27K OHM 5%	R107	R108			2
11		RD25PJ274X		CARBON FILM R.	0.25W 270K OHM 5%	R1	R14	R16		3
12		RD25PJ331X		CARBON FILM R.	0.25W 330 OHM 5%	R123	R27	R30	R34	5
13						R89				
14		RD25PJ332X		CARBON FILM R.	0.25W 3.3K OHM 5%	R19				1
15		RD25PJ333X		CARBON FILM R.	0.25W 33K OHM 5%	R104	R13	R71		3
16		RD25PJ392X		CARBON FILM R.	0.25W 3.9K OHM 5%	R117	R118	R119	R120	6
17						R121	R122			
18		RD25PJ393X		CARBON FILM R.	0.25W 39K OHM 5%	R44	R50	R66		3
19		RD25PJ394X		CARBON FILM R.	0.25W 390K OHM 5%	R143	R144	R40		3
20		RD25PJ433X		CARBON FILM R.	0.25W 43K OHM 5%	R11				1
21		RD25PJ470X		CARBON FILM R.	0.25W 47 OHM 5%	R18	R26	R49	R90	4

EXPLODED ASSEMBLY	PART NAME: P.W.BOARD ASSY	PART CODE: APSTU051AD	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.				QTY USED
1		RD25PJ471X		CARBON FILM R.	0.25W 470 OHM 5%	R130	R131	R67		3
2		RD25PJ472X		CARBON FILM R.	0.25W 4.7K OHM 5%	R127	R129	R74		3
3		RD25PJ473X		CARBON FILM R.	0.25W 47K OHM 5%	R101	R103	R60	R87	6
4						R95	R96			
5		RD25PJ474X		CARBON FILM R.	0.25W 470K OHM 5%	R72				1
6		RD25PJ561X		CARBON FILM R.	0.25W 560 OHM 5%	R55	R69			2
7		RD25PJ562X		CARBON FILM R.	0.25W 5.6K OHM 5%	R54	R80			2
8		RD25PJ563X		CARBON FILM R.	0.25W 56K OHM 5%	R102	R56			2
9		RD25PJ564X		CARBON FILM R.	0.25W 560K OHM 5%	R62	R82	R83		3
10		RD25PJ623X		CARBON FILM R.	0.25W 62K OHM 5%	R157	R158			2
11		RD25PJ682X		CARBON FILM R.	0.25W 6.8K OHM 5%	R100	R42	R99		3
12		RD25PJ754X		CARBON FILM R.	0.25W 750K OHM 5%	R159	R160			2
13		RD25PJ821X		CARBON FILM R.	0.25W 820 OHM 5%	R20	R86			2
14		RD25PJ822X		CARBON FILM R.	0.25W 8.2K OHM 5%	R109	R110	R57		3
15		RD25PJ823X		CARBON FILM R.	0.25W 82K OHM 5%	R17				1
16		RD25PJ911X		CARBON FILM R.	0.25W 910 OHM 5%	R113	R114			2
17		RD25TJ103X		CARBON FILM R.	0.25W 10K OHM 5%	R170				1
18		RD25TJ154X		CARBON FILM R.	0.25W 150K OHM 5%	R172				1
19		RD25TJ222X		CARBON FILM R.	0.25W 2.2K OHM 5%	R171				1
20		RG1ANJ181B		M-OXIDE FILM R.	1W 180 OHM 5%	R134	R135			2
21		RPGN820201		SEMI-FIXED VR.	2K OHM B-CURVE	RV1				1

EXPLODED ASSEMBLY	PART NAME: P.W.BOARD ASSY	PART CODE: APSTU051AD	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		RPGNB20301		SEMI-FIXED VR.	20K OHM B-CURVE	RV3	1
2		RPGNB20401		SEMI-FIXED VR.	200K OHM B-CURVE	RV6	1
3		RPGNB50201		SEMI-FIXED VR.	5K OHM B-CURVE	RV4	1
4		RPGNB50302		SEMI-FIXED VR.	50K OHM B-CURVE	RV2	1
5		RPJN310306		SEMI FIXED VR.	10K OHM B-CURVE	RV5	1
6		SH060608UN		SLIDE SWITCH		S1A-F	1
7		TR07EA002S		I.F.T.		T2 T3	2
8		TR10MM016K		I F T		T4	1
9		TR10MM017K		I F T		T5	1
10		TR10MZ004S		I.F.T.		T1	1
11		WUG120EEXX		HI-WRAP WIRE		NO1	1
12		WUG216EEXX		HI-WRAP WIRE		NO2	1
13		WUG316EEXX		HI-WRAP WIRE		NO3	1
14		WUG412EEXX		HI-WRAP WIRE		NO4	1
15		WUG526EEXX		HI-WRAP WIRE		NO5	1
16		WUG612EEXX		HI-WRAP WIRE		NO6	1
17		WUG715EEXX		HI-WRAP WIRE		NO7	1
18		WUG819EEXX		HI-WRAP WIRE		NO8	1
19		WWF116JXJJ		SHIELDED WIRE		NO9	1
20		YJD05S011Z		5P DIN JACK		J4	1
21		YJP04S02UU		4P PIN JACK		J1 J2	2

EXPLODED ASSEMBLY	PART NAME: P.W.BOARD ASSY	PART CODE: APSTU051AD	

ITEM	REMARKS	PART CODE	PART, STOCK NUMBER	PART NAME	SPECIFICATIONS	SYMBOLIC OR EXPLODED VIEW NO.	QTY USED
1		YJP06S010U		6P PIN JACK		J3	1
2							
3							
4							
5							
6							
7							
8							
9							
10							
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12							
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20							
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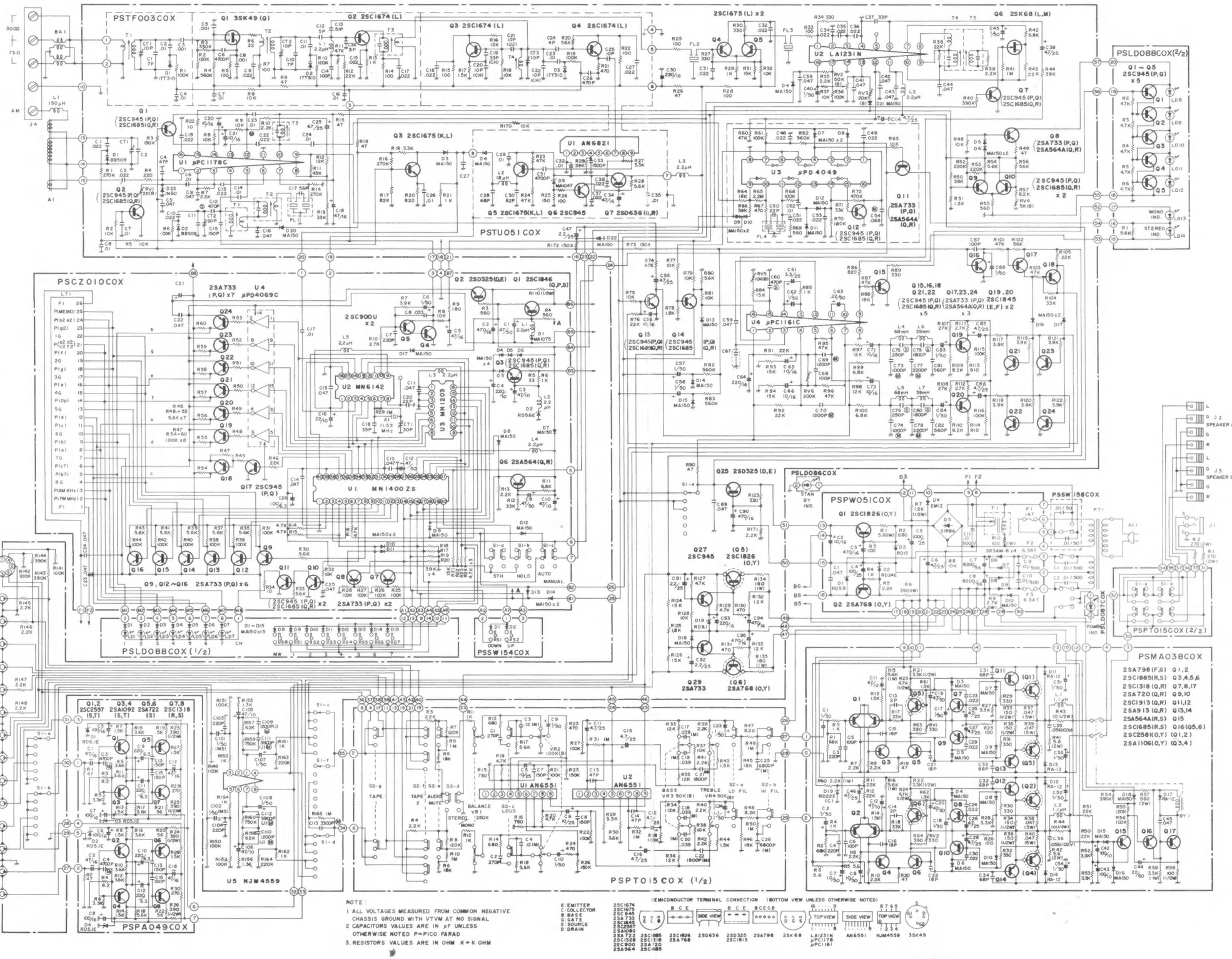
SRC-80

Schematic Diagram



NOTE:
1 ALL VOLTAGES MEASURED FROM COMMON NEGATIVE CHASSIS GROUND WITH VTVM AT NO SIGNAL
2 CAPACITORS VALUES ARE IN μF UNLESS OTHERWISE NOTED P=PICO FARAD
3. RESISTORS VALUES ARE IN OHM K=K OHM

E:EMITTER
C:COLLECTOR
B:BASE
G:GATE
S:SOURCE
D:DRAIN

SEMICONDUCTOR TERMINAL CONNECTION (BOTTOM VIEW UNLESS OTHERWISE NOTED)

2SC1674 2SC1675 2SC945 2SA733 2SC1845 2SC2557 2SA1092 2SA722 2SC1328 2SC900 2SA564 — B C E — SIDE VIEW
2SC1826 2SA768 — B C E
2SD636 — B C E
2SD325 2SC1913 2SA798 — B C E
2SK68 — D G S
LA1231N μPC1178 μPC1161 — HG 9 … 1 — TOP VIEW
AN6551 — SIDE VIEW
NJM4559 — TOP VIEW
3SK49 — S D G D

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